PEC
Process
Engineering
Company

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PRELIMINARY BASIC ENGINEERING STUDY.QUOTATION NO.01-99.004/24
FOR A TABACCO DENTIFICATION PLANT.
FOR:PHILIP MORRIS RESEARCH AND DEVELOPMENT DIVISION NEUCHATEL.

PEC, Process Engineering Company

CH-8708 Männedorf, Switzerland
Alte Landstrasse 415, P.O. Box
Telephone: 01 9221101, Telex: 75508
Cables: Servochemie Männedorf

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MINC PA[illegible]

UGA/2[illegible]
July [illegible]

New figures as derived from the revised flow rate for SEL of

100 gal/min ≙ [illegible] l/min ≙ 22.7 m^3/h

≙ [illegible] m^3/d ≙ 191'000 m^3/year

≙ [illegible] 50'457'000 gal/year

and based on the data prepared by Chemapec.

No dilution water through pump 01-PC-03.04.

Dilution rate in fermenter D = 0.22

Hot water for corn syrup 5.3 m^3/h

Fermenter feed rate 30.0 m^3/h (6.4 % TS-SEL)

Corn syrup 50 % sugar content

Mean Nitrate-N [illegible] ppm

Mean sugar : $\frac{330}{208}$ · [illegible] = 6.7 %

corresponding to 1'500 kg/h sugar ≙ 3'000 kg/h corn syrup

≙ 72'000 kg/[illegible] ≙ 48 [illegible]/day ≙ [illegible] m^3/h

Acid : [illegible] phosphoric (pH = 3.5)

	acid conc.	total conc.	
30 m^3/h	x [illegible]	100 kg/h	→ 70 kg/h H_3PO_4 conc
			→ 810 kg/h CH_3COOH conc
		≙ 2'160 [illegible]/day	H_3PO_4 conc
		≙ 19[illegible] [illegible]/day	CH_3COOH conc

All energy + [illegible] requirements up by 10 % on top of reference.
This Δ is based on the peak (peak for sterilization and [illegible]).

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Yield denitrated SEL of 8.5 % TS-SEL:

20.1 m^3/h ≒ 482 m^3/d = 168'870 m^3/year
≒ 44'611'000 gal/year

Yield NINOMASS of 92 % DM:

649 kg/h ≒ 15.6 t/d ≒ 5'453 t/year
≒ 12'020'000 lbs/year

	PEAK	AVERAGE
STEAM	5'192 lbs/h ≒ 2'355 kg/h	4'630 lbs/h ≒ 2'100 kg/h
COOLING WATER	276'852 gal/h ≒ 1'048 m^3/h	255'719 gal/h ≒ 968 m^3/h
HOT WATER	6'287 gal ≒ 23.8 m^3	2'324 gal ≒ 8.8 m^3
AIR	220 m^3/m ≒ 13'200 m^3/h	
PROCESS WATER	4'834 gal/h ≒ 18.3 m^3/h	872 gal/h ≒ 3.3 m^3/h
ELECTR. ENERGY	1'492 kW	1'282 kW

8.5 % TS ⟶ 48 % TS

ADDED REQUIREMENTS

STEAM	5'335 lbs/h ≒ 2'420 kg/h
COOLING WATER	23'247 gal/h ≒ 88 m^3/h
ELECTR. ENERGY	31 kW

TOTAL (ADDED UP)

STEAM	10'527 lbs/h ≒ 4'775 kg/h	9'094 lbs/h ≒ 4'125 kg/h
COOLING WATER	300'099 gal/h ≒ 1'136 m^3/h	278'966 gal/h ≒ 1'056 m^3/h
ELECTR. ENERGY	1'523 kW	1'313 kW

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LABOUR REQUIREMENTS	Shift	Total
Supervisor	1	4
Lab.	-	2
Chem. prep. + steril. + ferment.	2	8
Separ. + evap. + drying	2	8
Ninomass storage + packag.	-	2
		24

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PRELIMINARY BASIC ENGINEERING STUDY

QUOTATION NO. 01 - 99.004/24

REF: WA 19041

FOR A TOBACCO DENITRATION PLANT BASED ON SEL EXTRACTION FLOW OF 436 m3 / DAY AT 9% TOTAL SOLIDS, WITH A PRODUCTION OF NINOMASS OF 14'171 kg / DAY AT 92% DM, AND TOBACCO EXTRACT OF 1,6 m3/h AT 48% DM

for: Philip Morris
Research and Development Div.
CH - 2000 Neuchâtel

presented by: PEC Process Engineering Company
Alte Landstrasse 415
CH - 8708 Männedorf

Männedorf, July 14th, 1980
W. Frei/lm

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   - Chemical storage

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6. Erection and Startup

7. Battery limits

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1. PEC PROCESS ENGINEERING COMPANY

a member of the Chemap Group, Männedorf, Switzerland, is a highly intergrated engineering group with world-wide activities, which evolved over the years with special expertise in the field of bio-conversion and utilisation of agricultural products.
This expertise in bio-engineering processes and concomitant design of fermentation equipment has caused the services of PEC to be widely sought.

Chemapec INC., Woodbury, NY, is the US member of the Chemap Group. It has carried out these same services and activities throughout America, for over 15 years.

The PEC engineering group comprises several teams of bio-Chemists, process engineers and design engineers, supported by the appropriate staff of mechanical engineers and field engineers.
The parent Chemap Group was founded by Dr. H. Müller, Chemical Engineer, in Zürich 1946.

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The bio-engineering activities have covered the entire gamut of sterile fermentation technology from research intense production of vaccines and antibiotics to the production of bulk chemicals and food ingredients, such as citric, acid, ethyl alcohol, vinegar, bakers'yeast, single cell protein for fodder yeast for animal, poultry and fish farming, as well as instant soup formulations.

These processes are designed to be based on many agricultural feedstocks, ranging from sugar molasses to many different types of cereals and many different starch-bearing seeds. Lignocellulose is also becoming an important feedstock.

Our services

As Project Manager, PEC, Process Engineering Company covers the entire range of activity required by the client.

- Management Planning
- Feasibility Studies
- Economic Studies
- Technical Studies
  - waste treatment
  - heat recovery
  - energy studies
- Engineering & Design
- Site Selection
- Project Planning
- Master Scheduling
- Regulatory Guidance agency
- Procurement
  - specification preparation
  - vendor selection
  - bid evaluation
- Construction Specifications
- Construction Management
- Personnel Training
- Operations Procedures

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2. DESCRIPTION OF THE PROCESS

Flowsheet No. 3x-951 3203

Group 01 Medium Preparation

The SEL Extract from Park 500 at a flow of 18,2 m3/h and 9% TS is fed to the sterilization plant (01-HE-01, 02) by means of the pump (01-PC-01, 02). Before entering the plant, the SEL is diluted to a solids content of 8% TS. Through the pump (01-PC-03, 04), the dilution water is added to the SEL flow at a flow rate of 2,3 m3/h.

At a flow of 20,5 m3/h the SEL will be sterilized. A spiral heat exchanger is used for recuperative pre-heating of the SEL up to 90°C. Then the product is heated by steam injection to a temperature of 130°C. Subsequently it enters a second spiral heat exchanger with a holding time of 5 minutes. Cooling to 35°C is achieved in the final heat exchanger (spiral type) by means of cooling water. A plate heat exchanger is installed for the intermediate cooling of the circulating water during sterilization of the sterilizing plant.

The sterile medium flows into the buffer tanks (01-T-01, 02). The SEL is afterwards drawn off from the tank and fed into the main fermentors by means of flow-controlled volumetric pumps (01-P-08, 07).

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Before entering the fermentors, NO_3-N is measured. The additive requirement is 4% sugar for 1'083 ppm nitrate-nitrogen (NO_3-N). The control range for sugar addition should be from 1'200 to 2'500 ppm NO_3-N in the incoming SEL flow at 9% TS. The above-mentioned measurement is continuous and the correct sugar addition is achieved by mixing water and corn syrup into the SEL at 8% TS. The corn syrup with 50% sugar content is stored in the tanks 01-T-03, 04. To ensure a constant flow of $7m^3/h$ into the SEL flow (ratio 3:1), the corn syrup is mixed by means of the double-head metering pump (01-P-05, 06), in which the hot water flow is kept constant at $6,2\ m^3/h$. The corn syrup is varied according to the NO_3-N content in the SEL. The water/corn syrup mixture is sterilized in a similar sterilization system (01-HE-03, 04) to that described for the SEL.

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Group 02 Seed Line

In order to achieve efficient denitration in the main fermentors, a reliable inoculum system is needed. For this reason a Seed Lime is set up containing three individual fermentation units.

The first item is the pure culture fermentor, a 14-litre laboratory Chemap fermentor 02-TF-01 where the yeast culture is grown. This fermentor is a compact unit equipped with a glass shell, bottom driven and interchangeable stirrer system. The Fundafom ® is a mechanical foam breaker and is flanged on the cover of the fermentor. Control of parameters (such as temperature, rpm, pH, pO_2) is included in the control panel of the unit. A signal from the panel activates the peristaltic pumps for the base and acid feed into the fermentor.

The second step of the Seed Line is the seed fermentor 02-TF-02. A 150-litre pilot fermentor unit with a separate control panel is foreseen (see description item 02-TF-02), complete with control of pO_2, pH and temperature. It is operated through the control panel. After filling the fermentor with the SEL and corn syrup to the required level, the full sterilization of the substrate takes place. Subsequently the fermentor is inoculated by means of a sterile transfer line from the pure culture fermentor.

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As soon as the yeast has grown sufficiently, the cell suspension is transferred as inoculum to the pre-fermentor 02-TF-03. This is a 4,5 m^3 fermentor (see description in Group 2). An Effigas circulating system is built into the fermentor for aeration and mixing. This system is explained in a separate documentation. Full sterilization is guaranteed by built-in heat exchange elements and jacket. PO_2, T and pH probes are attached. They are connected to the control panel to guarantee an accurate monitoring of base and acid addition, aeration and temperature. The addition of base, acid and antifoam liquid is obtained by sterile compressed air.

When yeast growth is complete, the cell suspension can be transferred to the main fermentors, and operation of the plant can begin.

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Group 03 Chemicals

The KOH tank 03-TM-01 is 1 m^3 in size. Before filling, it is sterilized empty. For cooling, the vessel is equipped with a cooling jacket. The tank will be filled daily with KOH and water. To ensure good dissolving of the crystals, the tank is equipped with a Vibro® Mixer. Feeding into the main fermentors is achieved by compressed air entering through a sterile filter.

The acid tank, which is glass lined, has a volume of 10 m^3 (03-T-02). It contains 85% phosphoric acid or a mixture of acids. It is sterilized when empty and filled once a day from the chemical storage. The level is controlled by a pressure transmitter. Compressed air is used for feeding into the main fermentors.

Two antifoam vessels (03-TM-03, 04) of 1 m^3 each are provided for the foam control in the main fermentors. If one is empty, the other is switched on. They must therefore both be fully sterilized. To ensure good emulsifying, they are equipped with stirrers. Feeding into the main fermentors is achieved with compressed air.

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Group 04 Main Fermentation

The main fermentation unit consists of four fermentors of 75 m^3 total volume (04-TF-01, 02, 03, 04). They are made of SST 316 material and equipped with bottom drive, Effigas® system, Fundafom® and cooling baffles. Prior to filling, the fermentors are cleaned using six CIP high-pressure sprayballs. After cleaning, the fermentors are sterilized with direct steam to a temperature of 121°C and then cooled to 35°C. Cultivation can then begin, using three fermentors, while the fourth is on stand-by. The fermentors are fed continuously at a rate of 27,25 m^3/h. For the start-up, the 3 m^3 of inoculum from the seed fermentor enters the main fermentors. Continuous cultivation then takes place with a dilution rate of 0,2. The principle of this continuous fermentation is based on an adjustable and constant feed of substrate by means of a volumetric pump (01-P-07/08), and on the outlet side by a weight-controlled harvest system at the bottom of the fermentors. A load cell is positioned under one leg of the fermentors to control the level. Simultaneous measurement of pH, T, and pO_2 is achieved by probes in the mantle of the vessel.

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The required flow is ensured by a signal from the control panel and an impulse to the pneumatic valves of the chemical feed lines. In the event of contamination, one fermentor is switched off and the stand-by one starts working. In this case the inoculum is drawn off from the main harvest line. The contaminated vessel can then be emptied and cleaned without interrupting the process. The fermented broth leaves the fermentors at a flow of 27,25 m^3/h and passes through the harvest tank No. 04-T-01 to the pump No. 04-P-01, 02. This tank is of 5 m^3 volume and prevents empty running of the volumetric pump. By means of the above-mentioned pumps, the fermented broth is fed into the buffer tanks (04-T-02, 03), one of which is in operation while the other is on stand-by. These tanks are designed for sterile operation, have a volume of 15 m^3 and are equipped with cooling jackets. The level transmitter at the bottom of the tanks prevents overfilling.

The fermented broth is drawn off from the buffer tanks by pump 04-PC-03, 04 and fed to the separation line.

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Group 05 Separation and Evaporation of Extract

The Ninomass is separated from the extract by three nozzle-type separators (05-SEP-01, 02, 03). Separation and washing takes place in two stages. The third separator is stand-by. After the concentrating/separating step, the extract passes to the evaporation plant with a flow rate of approx. 25,9 m^3/h and 3% TS. The Ninomass is diluted with the same amount of water as used for dilution in pump pit 05-T-01. The level transmitter in the pit activates the pump 05-PC-01, which feeds the Ninomass to the second separator. The Ninomass is fed to the holding tanks through pump 05-PC-02 at a rate of 3,02 m^3/h and 18% TS.

The extract enters the three-stage evaporator unit (05-EV-01) at a flow of 25 m^3/h and 3% TS and leaves at 8,6 m^3/h and 9% TS. By means of the optionally provided second evaporator, the extract can be concentrated to 1,6 m^3/h and 46% TS.

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Group 06 Evaporation, Drying and Packing of Ninomass

From the 15 m^3 holding tanks (06-T-02/03) the Ninomass is fed to a three-stage evaporation plant (06-HE-01) at a flow of 3,02 m^3/h and 18% TS. Leaving the evaporation plant at 2,1 m^3/h and 25% TS, the product is fed by means of a volumetric pump (06-P-01) through the thermolizer (06-HE-01) to the intermediate 15 m^3 holding tank 06-T-03. A volumetric pump (06-P-02) feeds the Ninomass to the spray dryer plant 06-DRY-01. The water in the product is evaporated through hot air coming from a burner. The dried Ninomass is subsequently blown through a Cyclone system.

The final product, i.e. 590 kg/h and 92% DM is packed up by the packing machine 06-PACK-01. Since the packing shift is a normal 8-hour shift, a silo of 100 m^3 (06-SIL-01) for four days' production is installed. After passing from the packing machine to the palatizing installation, the Ninomass has reached its final stage and is ready for despatch.

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	ITEM NO	SPECIFICATIONS	kW	MAT.	CAPACITY/SIZE	REMARKS (DRWG NO)
		GROUP 01 MEDIUM PREPARATION				
	PC-01	Centrifugal pump	5,5	4435	19m^3/h	For SEL 9% TS
	PC-02	Centrifugal pump	5,5	4435	19m^3/h	Stand by
	PC-03	Centrifugal pump	1,5	4435	3m^3/h	For Dil. W
	PC-04	Centrifugal pump	1,5	4435	3m^3/h	Stand by
	P -05	Metering pump	5	4301	7m^3/h	For corn syrup
	P -06	Metering pump	5	4301	7m^3/h	Stand by
	P -07	Volumetric p	3	4435	20,5m^3/h	For SEL 8% TS
	P -08	Volumetric p	3	4435	20,5m^3/h	For SEL 8% TS
	T -01	Buffer tank		4301	20m^3/h	For SEL
	T -02	Buffer tank		4301	20m^3/h	For SEL
	T -03	Storage tank		CS	385m^3/h	For corn sirup
	T -04	Storage tank		CS	385m^3/h	For corn sirup
	HE-01	Sterilisation unit		4435	20m^3/h	For SEL
	HE-02	Sterilisation unit		4435	20m^3/h	For SEL
	HE-03	Sterilisation unit		4435	7m^3/h	For corn syrup
	HE-04	Sterilisation unit		4435	7m^3/h	For corn syrup
		GROUP 02 SEED LINE				
	TF-01	Labor fermenter	4	SS	14 ltr	Fully equipped
	TF-02	Pilot plant	15	SS	150 ltr	Fully equipped
	TF-03	Seed fermenter	25	SS	4,5m^3	Fully equipped
		GROUP 03 CHEMICALS				
	TM-01	Mixing tank	1	4301	1m^3	With vibro mixer
	T -02	Tank		4435	10m^3	
	TM-03	Mixing tank	1,5	4301	1m^3	With agitator
	TM-04	Mixing tank	1,5	4301	1m^3	With agitator

Process flowsheet
equipment list

GROUP 01 02 03

SCALE %

DRWD BY 11.7.80
CHECKED BY
PROJ. ENG.
PROC. ENG

PEC Process Engineering Company, CH 8708 Mannedorf, Switzerland

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SHT 1 of 2

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	ITEM NO	SPECIFICATIONS	kW	MAT.	CAPACITY / SIZE	REMARKS (DRWG NO)
		GROUP 04 FERMENTATION				
	TF-01	Main fermenter	220	4435	75 m^3	Fully equipped
	TF-02	Main fermenter	220	4435	75 m^3	Fully equipped
	TF-03	Main fermenter	220	4435	75 m^3	Fully equipped
	TF-04	Main fermenter	220	4435	75 m^3	Fully equipped
	T -01	Harvest tank		4301	5 m^3	
	T -02	Buffer tank		4301	15 m^3	
	T -03	Buffer tank		4301	15 m^3	
	P -01	Volumetric pump	4,2	4435	28 m^3/h	For fermented broth
	P -02	Volumetric pump	4,2	4435	28 m^3/h	Stand by
	PC-03	Centrifugal pump	2,2	4435	30 m^3/h	
	PC-04	Centrifugal pump	2,2	4435	30 m^3/h	Stand by
		GROUP 05 SEPARATION + EVAPARATION (EXTRACT)				
	SEP-01	Separator	80	SST	25,9 m^3/h	
	SEP-02	Separator	80	SST	25,9 m^3/h	
	SEP-03	Separator	80	SST	25,9 m^3/h	
	T -01	Pump pit		4301	2 m^3	
	PC -01	Centrifugal pump	2,2	4435	30 m^3/h	
	PC -02	Centrifugal pump	1,5	4435	3 m^3/h	
	EV -01	Evaporation plant		SST	25,9 m^3/h	Fully equipped
		GROUP 06 EVAPORATION, DRYING AND PACKING (NINOMAS)				
	EV -01	Evaporation plant		SST	3,4 m^3/h	Fully equipped
	T -01	Buffer tank		4301	15 m^3	
	T -02	Buffer tank		4301	15 m^3	
	T -03	Buffer tank		4301	15 m	
	P -01	Volumetric pump	0,5	4435	2,2 m^3/h	
	P -02	Volumetric pump	0,5	4435	2,2 m^3/h	
	HE -01	Heat exchanger		4301	2,2 m^3/h	
	DRY-01	Drying plant		SST	2,2 m^3/h	Fully equipped
	CY -01	Cyclone		4301	0,6 m^3/h	To drying plant
	PACK-01	Packing machine		SST	25 kg bags	Fully equipped
	SIL-01	Silo		4301	100 m^3	f. Ninomas 92% Ts

Process flowsheet
Equipment list

GROUP	SCALE	DRWD BY	11.7.80
04		CHECKED BY	
05	*/.	PROJ. ENG.	
06		PROC ENG	

PEC Process Engineering Company
CH 8708 Mannedorf, Switzerland

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SHT 2 of 2

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3. PLANT AND INSTALLATION

3.1 Group 01 Medium Preparation
acc. flow sheet No. 2 x 951 3226

3.2 Group 02 Seed Line
acc. flow sheet No. 2 - 951 3227

3.3 Group 03 Chemicals
acc. flow sheet No. 2 - 951 3228

3.4 Group 04 Fermentation
acc. flow sheet No. 2 x 951 3229

3.5 Group 05 Separation and Evaporation of Tobacco Extract

3.6 Group 06 Evaporation, Drying and Packing of Ninomass

3.7 Storage of Chemicals
acc. flow sheet No. 3 - 951 3222

3.8 CIP - System
acc. flow sheet No. 4 x - 951 3230

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyj0000

MEDIUM PREPARATION	GROUP NO. 01	OFFER NO.	WA: 19'041
PHILIP MORRIS SCHWEIZ		ORDER NO.	PAGE: 1

ITEM	PIECE	SPECIFICATION	kW	MAT.	SIZE / CAP.	REMARKS
PC-01	1	Centrifugal pump	5,5	1.4301	18,2 m^3/h	For SEL ~~sel~~ extract
PC-02	1	Centrifugal pump	5,5	1.4301	18,2 m^3/h	Stand by
PC-03	1	Centrifugal pump	1,5	1.4301	2,3 m^3/h	For dilution water
PC-04	1	Centrifugal pump	1,5	1.4301	2,3 m^3/h	Stand by
PC-05	1	Metering pump	5	1.4435	6,2 m^3/h 401 l /h	Water cornsirup
PC-06	1	Metering pump	5	1.4435	6,2 m^3/h 836 l /h	Water stand by cornsirup.
P -07	1	Volumetric pump	3	1.4301	~~20,5m~~ ^{3}/h	For diluted SEL
P -08	1	Volumetric pump	3	1.4301	20,5m^3/h	Stand by
T -01	1	Buffer tank	-	1.4301	20 m^3	
T -02	1	Buffer tank	-	1.4301	20 m^3	Stand by
T -03	1	Storage tank	-	CS	385 m^3	
T -04	1	Storage tank	-	CS	385 m^3	Stand by
HE-01	1	Sterilisation unit	-	1.4301	21 m^3/h	
HE-02	1	Sterilisation unit	-	1.4301	21 m^3/h	Stand by
HE-03	1	Sterilisation unit	-	1.4301	7 m^3	
HE-04	1	Sterilisation unit	-	1.4301	7 m^3	Stand by
FA-01	1	Air filter	-	1.4301	21,6Nm^3/h	
FA-02	1	Air filter	-	1.4301	21,6Nm^3/h	

p.e.c.	DATE: 11.7.80	CHECKED BY: W. Frei	NO. 4-951 3226. / 1

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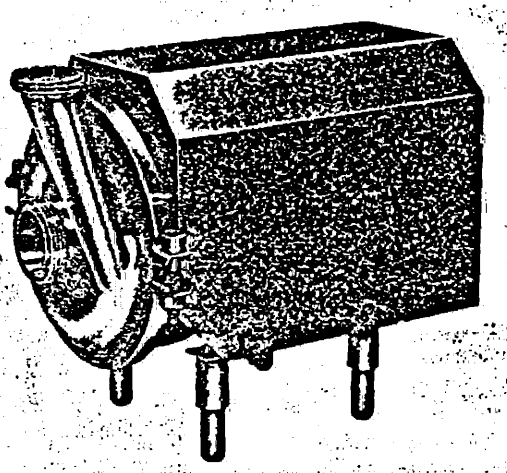
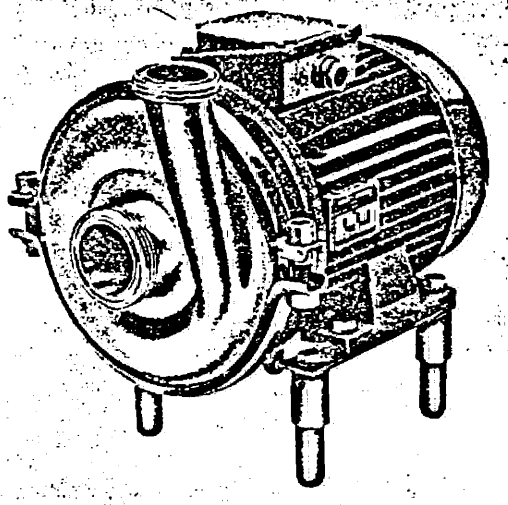
01-PC-01 } ALC-1/162
01-PC-02 }
01-PC-03 } ALC-1/120
01-PC-04 }

Application

La pompe centrifuge du type ALC-1 est recommandée pour l'utilisation dans l'industrie alimentaire et les industries chimiques, où de l'acier inoxydable anti-acide résiste aux liquides existants.

La pompe est munie d'une roue qui, avec le corps de forme hélicoïdale, assure un pompage efficace et un traitement ménageant du liquide.





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Construction standard

Matières

Toutes le pièces entrant en contact avec du liquide, c'est-à-dire le corps de pompe, la roue de pompe avec boulon et plaque arrière sont en acier anti-acide, AISI 316.

La frette est en acier inoxydable AISI 304. La bride intermédiaire sur le moteur est en fonte.

Joints en caoutchouc EP.

Garniture d'arbre

Joint plan équilibré, asservi par ressort, avec une bague d'étanchéité stationnaire fixe en matière céramique et un manchon d'étanchéité rotitif en charbon. Un système d'étanchéité équilibré signifie que la pression de pompage n'agit pas sur le joint.

Raccordements

Les raccords sont dotés de douilles de serrage ISO. Admission: 63,5 mm. Sortie: 51 mm.

Moteur

Moteur standard selon les normes IEC, 3000 tr/mn., courant alternatif triphasé 220/380 jusqu'à 4 kW, 380/660 V (380 △) au-dessus de 4 kW. Les deux alternatives peuvent être utilisées la marche sur du 360 V: 220/380 V pour démarrage direct et 380/660 V pour démarrage direct ou étoile-triangle.

	Roue de pompe Ø mm	Moteur kW
ALC-1	120	1,5—4
ALC-1	162	3 —7,5

Equipement optionnel

a) Pièces de raccordement en type autre que des douilles de serrage ISO
b) Ecrous, nipples, manchons et joints pour raccords
c) Roue de pompe de diamètre réduit
d) Vanne de réglage (SMO-R) pour la conduite de refoulement
e) Double joint d'arbre pour arrosage avec agent de blocage
f) Tension et fréquence autres que standard
g) Pieds inoxydables réglables, AISI 304
h) Capot de moteur et pieds en acier inoxydable, AISI 304
i) Joints en caoutchouc nitrile résistant aux huiles
k) Joints en viton pour liquides aggressives.

Débits

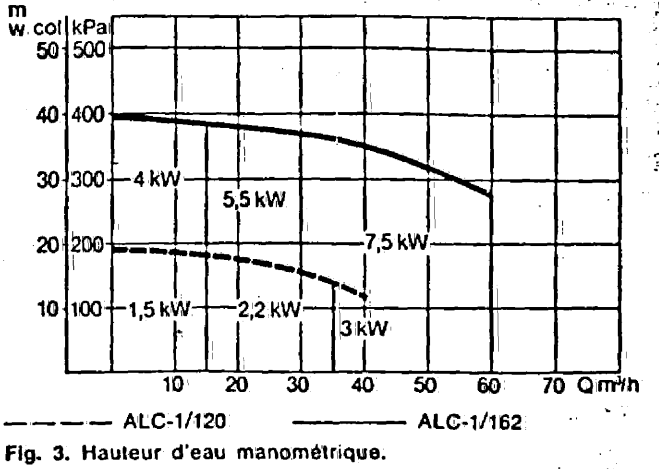

Fig. 3. Hauteur d'eau manométrique.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Colisage

Puissance du moteur	Poids net
1,5 kW	26 kg
2,2 kW	29 kg
3.0 kW	34 kg
4.0 kW	41 kg
5.5 kW	55 kg
7,5 kW	55 kg

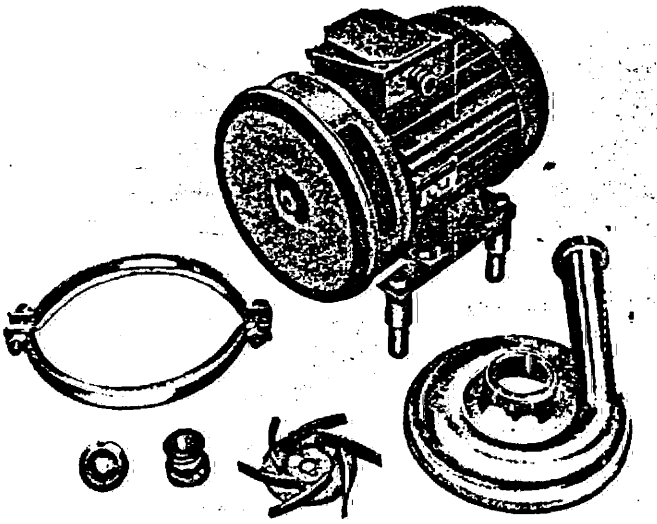
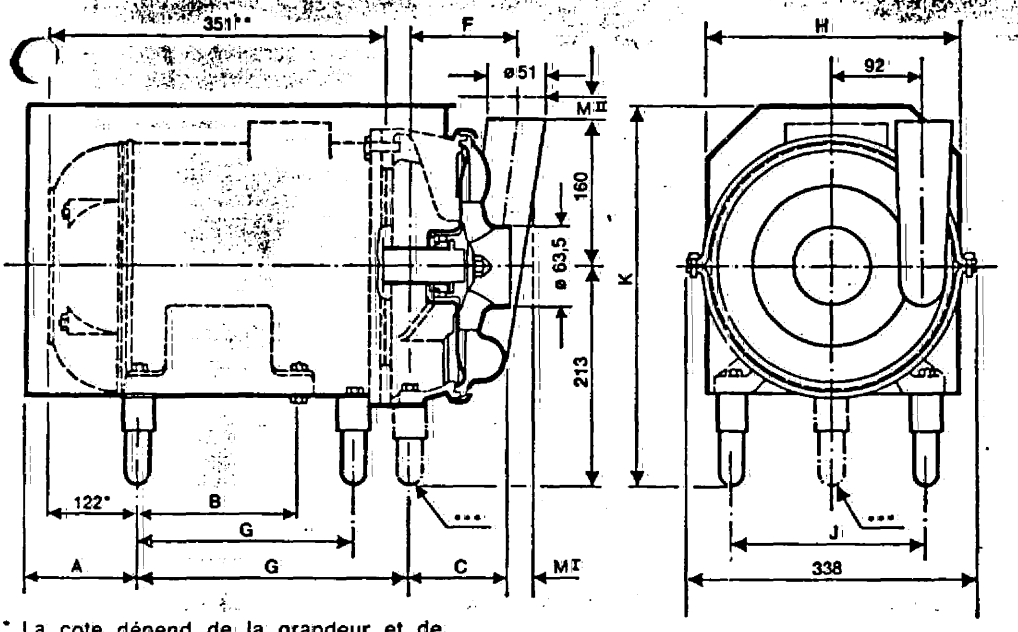


Fig. 4. Pompe ALC-1 démontée pour inspection.

Dimensions

Toutes les cotes en mm.



* La cote dépend de la grandeur et de la fabrication du moteur.
** Longueur max. de moteur pour pompe avec manteau.
*** Seulement un pied avant pour les moteurs de 5.5—7,5 kW.

Dimensions en mm	Moteur					
	1.5 kW	2,2 kW	3 kW	4 kW	5,5 kW	7,5 kW
A	106	106	111	111	154	154
B	100	125	140	140	140	140
C	95	95	119	119	81	81
F	119,5	119,5	143,5	143,5	105,5	105,5
G	150	175	183	190	267	267
H	248	248	255	255	319	319
J	140	140	160	190	216	216
K	347	347	372	372	390	390

Raccords					
DII 63,5 DII 51	ISO pince de serrage	ISO nipple	SMS nipple	DIN nipple	BS nipple
MI	28	21,5	24	25	24
MII	21,5	21,5	20	22	24

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ALFA-LAVAL
FLOW EQUIPMENT

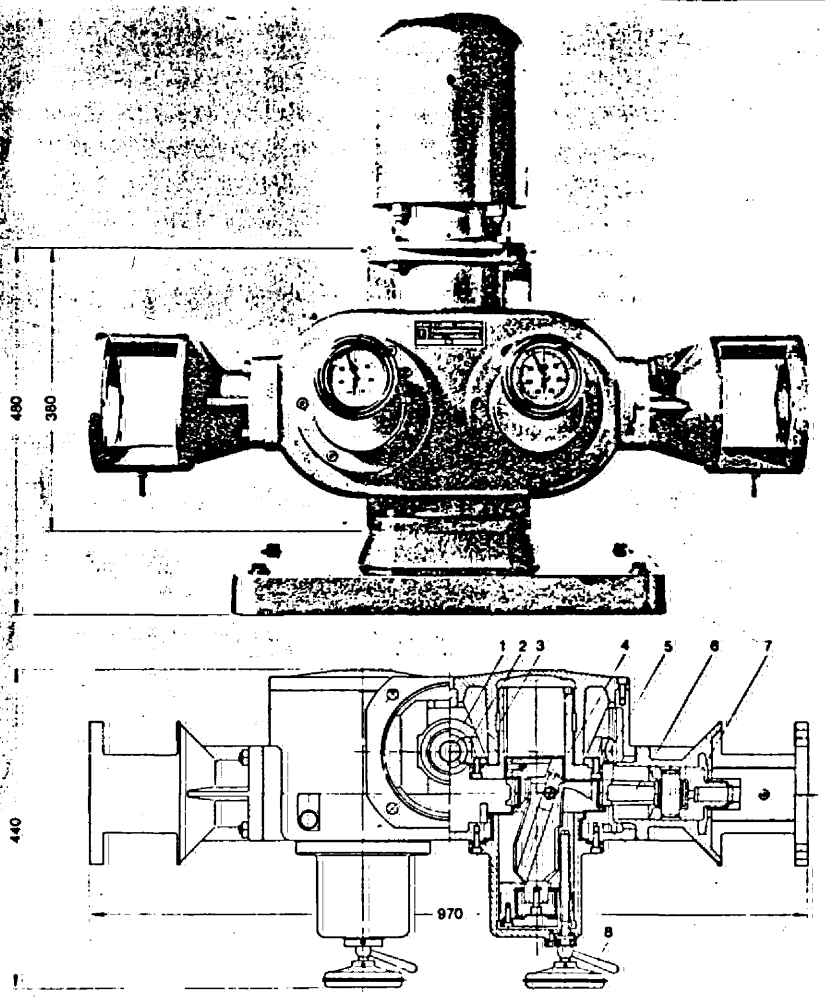
No. PD 61039F
Reg. 37285
7901
Printed in Sweden β

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

01-P-05
01-P-06

Gear C

M 1:7,5



Stroke length range	0 . . . 60 mm
Max. plunger force	800 kp
Stroke speed (with 50 c/s motors)	25, 50, 64, 72, **100**, **127**, 144, 200 min^{-1}

may be combined vertically and with gears KA, J, CS (and with B via angled gearing)

[1] Driving shaft with worm
[2] Worm wheel
[3] Driving sleeve
[4] Eccentric shaft
[5] Eccentric
[6] Connecting rod
[7] Crosshead with plunger clamping device
[8] Adjusting mechanism

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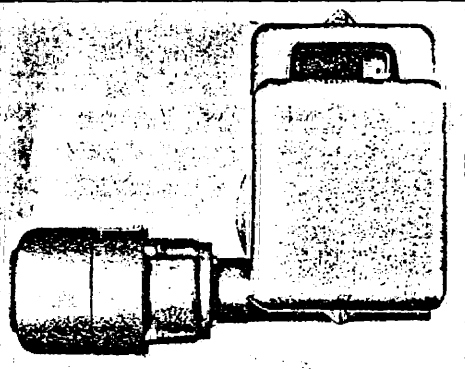
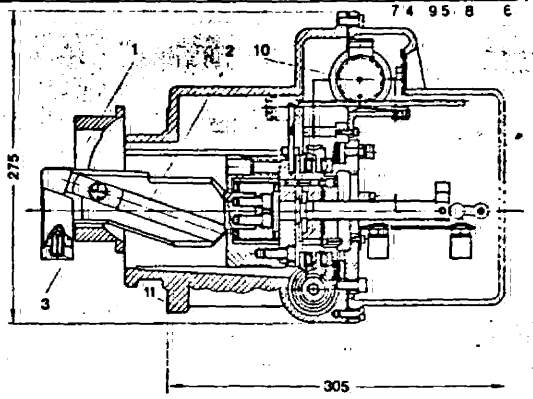
Source: https://www.industrydocuments.ucsf.edu/docs/hhy19000



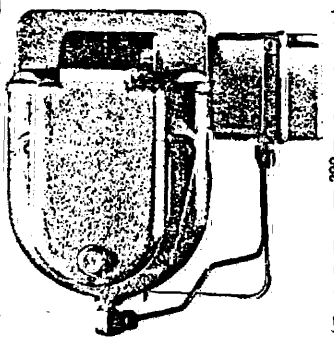


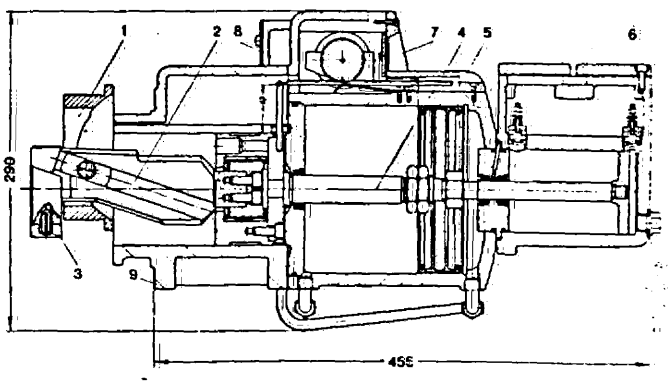
D/C 4
Electro-mechanical stroke adjustment while stationary and in motion

[1] Eccentric with guide block
[2] Eccenric shaft with keyway
[3] Driving member
[4] Adjusting nut
[5] Adjusting spindle
[6] End position switch
[7] Worm wheel
[8] Motor axis
[9] Stroke length indicator
[10] Feed-back potentiometer
[11] Connecting flange

Adjustment is carried out by means of an electric motor which moves the shaft via a worm gear and spindle. Limit stops keep the adjustment to within 0 and max. stroke length and end position switches shut-off the motor at those limits. A friction coupling is included to prevent the motor from being overloaded. A built-in transmitter allows the stroke length to be signalled to a remote indicator or to a regulator as a feed-back signal. The stroke length itself is indicated at the unit on a linear drum-scale.

The stroke length adjustment is linear.





D/C 5
Pneumatic stroke adjustment while stationary and in motion

[1] Eccentric with guide block
[2] Eccentric shaft with keyway
[3] Driving member
[4] Piston rod
[5] Regulating piston
[6] Damping cylinder
[7] Stroke length indicator
[8] Pneumatic position regulator
[9] Connecting flange

Adjustment is carried out by means of a double-acting pneumatic regulating cylinder. Control of the adjustment follows from a pneumatic position regulator. A signal from an appropriate source allows the position regulator to feed compressed air to the piston thus altering the stroke setting. The stroke length is indicated on the unit on a linear scale.

The stroke length adjustment is linear and directly proportional to the control pressure.

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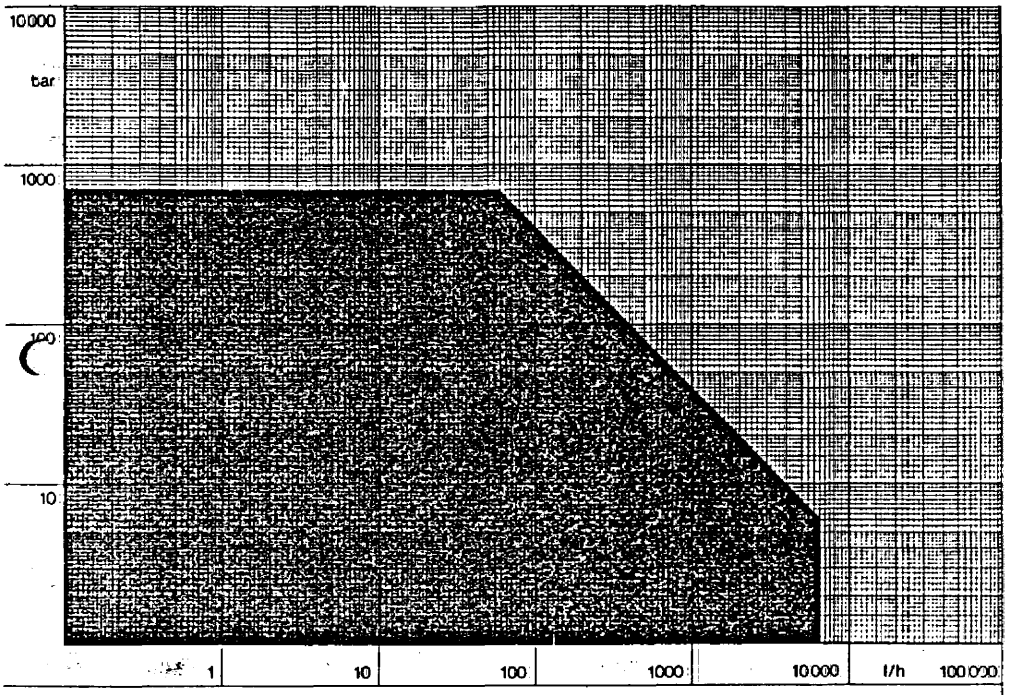
Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Capacity Table - Gear C



Plunger diameter	Plunger area	theor. stroke volume	Max. pressure	Suction & discharge connections	Max. metered flow per pumphead[1]) at a theoretical efficiency of 98 %						
					Continual metering at a stroke of min^{-1}			Batch metering			
					100	127	144	recommended volume[1])	at a stroke speed of min^{-1} 100	127	144
mm	cm²	cm³	bar		l/hr	l/hr	l/hr	cm³	l/hr	l/hr	l/hr
12	1,131	6,786	708	8	39,9	50,5	57,3	5	30	38,1	43,2
16	2,011	12,064	398	15	70,9	90,1	102,2	10	60	76,2	86,4
20	3,141	18,846	255		110,9	140,9	159,8				
25	4,909	29,452	163		173	219,9	249	20	120	152,4	172,8
30	7,069	42,412	113		249	316	359	40	240	304,8	345,6
36	10,179	61,073	78	25	359	455	516	50	300	381	432
42	13,847	83,082	57		488	619	702				
50	19,635	117,810	41		692	878	996	100	600	762	864
56	24,617	147,702	32		868	1102	1250				
62	30,175	181,050	26	32	1065	1351	1532				
68	36,317	217,900	22		1281	1625	1843	200	1200	1524	1728
75	44,179	265,072	18		1558	1978	2243	250	1500	1905	2160
82	52,783	316,698	15	40	1863	2366	2682				
90	63,585	381,510	12,5		2244	2849	3231	333⅓	2000	2540	2880
100	78,500	471,000	10		2764	3510	3980				
110	95,033	570,199	8,5		3353	4258	4828	500	3000	3910	4320
125	122,656	735,936	7	50	4329	5497	6233				

[1]) Both pumpheads work at the same stroke speed
[2]) when whole-number stroke volumes are necessary

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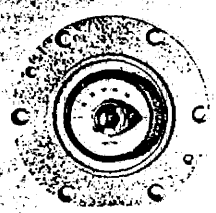
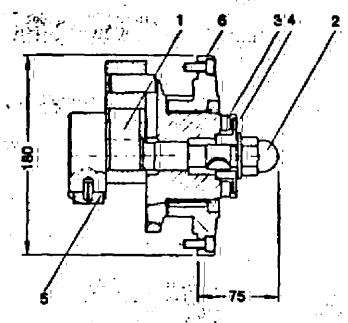
Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Stroke Adjusting Mechanisms D/C M 1:5



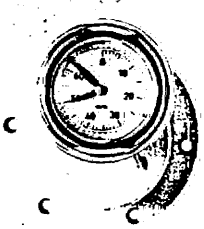


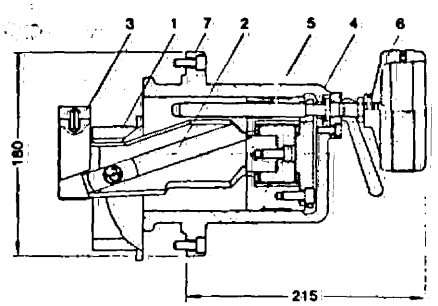
D/C 1
Manual stroke adjustment while stationary

[1] Double eccentric
[2] Cap nut
[3] Adjusting disc with drilled holes
[4] Scale
[5] Driving member
[6] Connecting flange

The crankpin consists of two eccentrics, one inside the other, which can be turned relative to each other. The stroke length can only be altered whilst stationary.

To do this the cap nut must first be slackened back. Using a dowel pin which fits the holes in the circumference of the adjusting disc the latter is turned, so altering the stroke. The setting is indicated on the scale underneath the mark on the disc.





D/C 3
Manual stroke adjustment while stationary and in motion.

[1] Eccentric with guide block
[2] Eccentric shaft with keyway
[3] Driving member
[4] Adjusting nut
[5] Adjusting spindle
[6] Handwheel with stroke indicator
[7] Connecting flange

The action consists of a sliding shaft with a keyway cut inclined to the rotation axis. The eccentric is held in place by a guide block sliding in this keyway. When the shaft is moved axially the eccentric moves at 90° to the rotation axis and so the stroke is altered.

Movement of the shaft is carried out by means of the handwheel and adjusting spindle. The double scale fitted inside the handwheel indicates the stroke length with two pointers. One shows full mms and the other mm fractions.

The stroke length adjustment is linear.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

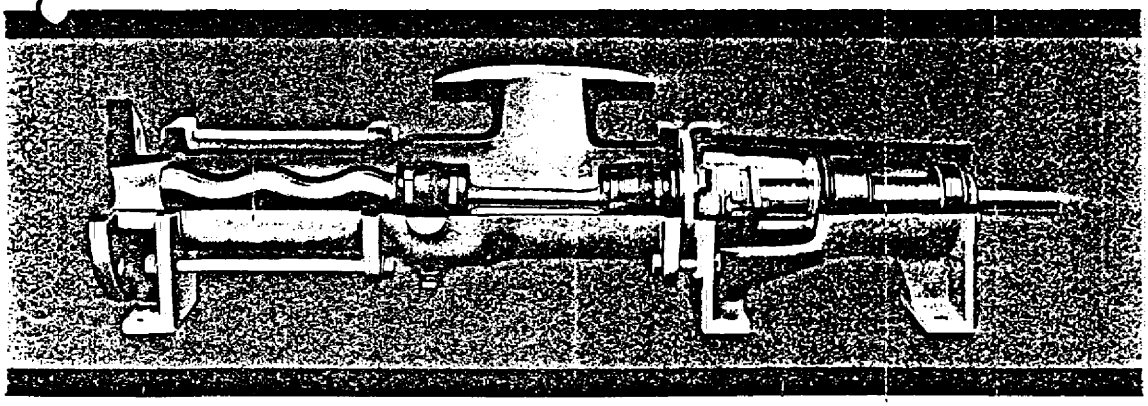
ALLWEILER SEEBERG PUMPEN

SEEBERG-Normal-Pumpe Baureihe SNP

01-P-07,08

mit den bekannten Vorteilen der Exzenterschneckenpumpe

- selbstansaugend bis 8,5 m W. S., auch bei Luft-Flüssigkeits-Gemisch
- hoher Wirkungsgrad über den gesamten Drehzahlbereich
- kontinuierliche Förderung
- für alle flüssigen, schäumenden, pastösen Medien mit oder ohne Feststoffgehalt
- bis zu 200 000 cP
- Drücke bis 6 bzw. 12 bar
- Drehzahl variabel, bis zu den niedrigsten Umdrehungen



und den markanten Konstruktionsvorteilen

- Stator im Rohr einvulkanisiert mit beidseitigen Bunden
- robuste, garantiert **dicht** gekapselte Gelenkanordnung
- auswechselbare Stopfbuchsgehäuse, 14 Arten von Wellenabdichtungen
- säurebeständige, verschleißfeste Wellenschonhülsen
- außergewöhnlich große Saug- und Druckgehäusequerschnitte

Über die besonderen Vorteile der ALLWEILER-SEEBERG-Pumpen, ihre Auslegung und Werkstoffe, ihre einmalige Kinematik und die vielfältigen Einsatzmöglichkeiten in den einzelnen Industriezweigen informiert Sie unsere Druckschrift 1-3-01

Druckschrift 1-30-01

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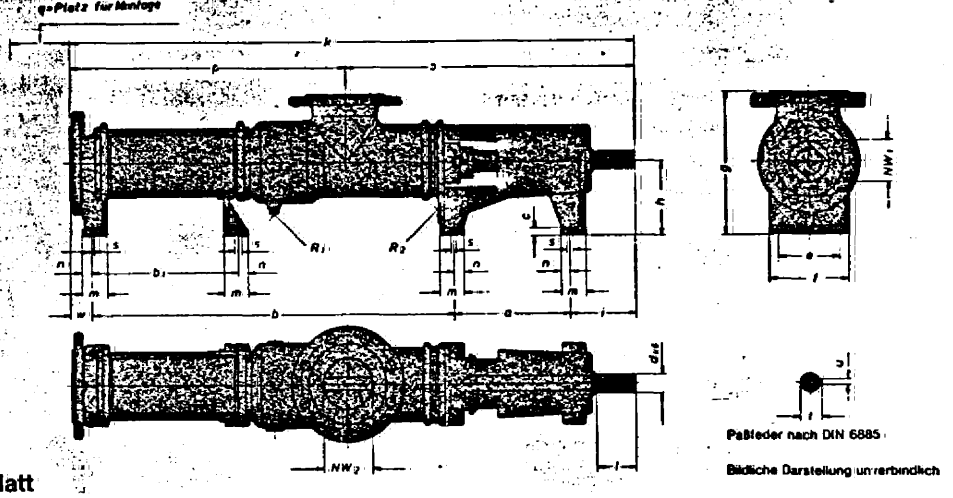
Source: https://www.industrydocuments.ucsf.edu/docs/hhy19000

Techn. Daten, Baugrößen und Bauformen (Erläuterung der Abkürzungen siehe Druckschrift 1-3-01)

Baureihe	Baugröße	max. Drücke (bar)	Bauformen H	V	P	G	D	Materialausführung Gehäuse rot. Teile Rotor	Stator Manschetten	Stopfbuchspackung	Gleitringdichtung	Fördermengen siehe Druckschrift 1-3-01 Größe	Saughöhe	Antriebsmöglichkeiten
X	12	1 = einstufig, max. 6 bar* 2 = zweistufig, max. 12 bar	horiz. Aufstellung H1, H2, H4	vertik. Aufstellung V1, V2, V4	Stopfbuchspackung ** P01 ... P04 P1 ... P4	Gleitringdichtung G0 ... G9	Doppelmantel D ... B ...	F 13 (c), F 12 (c), F 22 (c), E 22 (c), E 44 (c), K 22 (c), K 44 (c)	alle Qualitäten	alle Qualitäten	alle Qualitäten	12	max. 8,5 m WS, je nach Wellenabdichtung und Einsatzverhältnissen	1 ... 7. (Keilriementrieb bedingt möglich)
X'	25											25		
SNP	50											50		
	100											100		
	200											200		
	380											380		
	750											750		
	1450											1450		

*SNP 12 nur 2-stufig möglich
** nur bei Größe 12 bis 50 möglich



Maßblatt

Typ	Gehäuse a	b	b1	c	e	f	h	i	m	n	o	q	s	R1	R2	Wellenende d	l	t	u	Gew. kp
X 12.2	145	440	–	11	78	103	90	79	38	14	350	200	12	R ¾"	R ¼"	18	45	20,5	6	18
X 25.1	145	401	–	11	78	103	90	79	38	14	357	200	12	R ¾"	R ¼"	20	45	22,5	6	21
25.2		527	–									250								23
50.1	175	484	–	11	95	120	100	86	40	15	416	250	12	R ½"	R ¼"	22	50	24,5	6	30
50.2		644	–									330								34
100.1	200	600	–	13	105	137	125	102	45	18	487	300	14	R ½"	R ⅜"	28	65	30,9	8	45
100.2		800	–									400								56
200.1	225	715	–	14	120	155	140	120	50	20	562	350	14	R ½"	R ⅜"	35	75	38,3	10	65
200.2		967	–									500								77
380.1	270	860	–	15	145	185	160	141	55	20	667	450	18	R ¾"	R ½"	42	90	45,1	12	120
380.2		1166	–									650								148
750.1	310	1079	–	17	170	215	180	172	65	25	801	550	18	R ¾"	R ½"	55	110	58,8	16	160
750.2		1479	845									850								200
1450.1	370	1327	–	20	200	250	225	202	85	35	949	650	20	R 1"	R ½"	70	130	74,6	20	320
1450.2		1832	1070									1050								370

Typ	Flansche DIN 2633 NW1	NW2	k	p	w	q	Gewindestutzen DIN 11851 NW1	NW2	k	p	w	q	Flansche ASA B 16.1 (5)* NW1	NW2	k	p	w	q
12.2	32	40	695	345	31	170	32	40	695	345	31	170	1 ¼"	1 ½"	693	343	29	169
25.1	40	50	657	300	32	180	40	50	657	300	32	190	1 ½"	2"	656	299	31	178
25.2			783	426					783	426					782	425		
50.1	50	65	781	365	36	200	50	65	781	365	36	210	2"	2 ½"	779	363	34	200
50.2			941	525					941	525					939	523		
100.1	65	80	942	455	40	240	65	80	942	455	40	255	2 ½"	3"	942	455	40	240
100.2			1142	655					1142	655					1142	655		
200.1	80	100	1102	540	42	270	80	100	1102	540	42	290	3"	4"	1102	540	42	274
200.2			1354	792					1354	792					1354	792		
380.1	100	125	1317	650	46	310	–	–	–	–	–	–	4"	5"	1321	654	50	312
380.2			1623	956					–	–					1627	960		
750.1	150	150	1606	805	45	350	–	–	–	–	–	–	6"	6"	1610	809	49	354
750.2			2006	1205					–	–					2010	1209		
1450.1	200	200	1959	1010	60	420	–	–	–	–	–	–	8"	8"	1964	1015	65	425
1450.2			2464	1515					–	–					2469	1520		

Änderungen vorbehalten

*B 16.5 Class 150

ALLWEILER SEEBERG PUMPEN GMBH
Postfach 1220 · D-4272 Kirchhellen · Ostring 9
Telefon (0 21 45) 20 81 · Fernschreiber 08 579 414

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Source: https://www.industrydocuments.ucsf.edu/docs/hhy00000

TECHNICAL DATA

ITEM	SPECIFICATION	Nº PIECES	SIZE	REMARKS
A	PRODUCT INLET	1	NW 80	
B	AIR INLET	1	NW 3/8"	
C	CLEANING NOZZLE	1	NW 1"	
D	AIR OUTLET	---	---	
E	SIGHT GLASS WITH LAMP	---	---	
F	OVERFLOW	---	---	
G	SIGHT GLASS	---	---	
H	STEAM INLET	---	NW25	
I	AIR OUTLET	---	NW 25	
K	INOCULATION-TRANSFER	---	---	
L	STAND GLASS	---	---	
M	MANHOLE	1	NW 500	
N	HANDHOLE	---	---	
O	BOTTOM - OUTLET	---	NW 80	
P	PI - MANOMETER	---	---	
Q	SAMPLE VALVE	---	---	
R	CHEMICALS	---	---	
S	STIRRER FLANGE	---	NW 100	
T	LEVEL TRANSMITTER	---	---	
U	TI - THERMOMETER	---	---	
V	TEMP. TRANSMITTER	---	---	
W	PH TRANSMITTER	---	---	
Z	AP - PROBE	---	---	
Y	AF - INLET	---	---	
X	CIRCULATION	---	---	

VESSEL, WEIGHT, EMPTY 3200 kg
OPERATING WEIGHT, FILLED 8200 kg

A				
B				
C				

DRWG BY | CHECKED BY | PROJ ENG. | PROC ENG.

GROUP NO. | SCALE

100338413

Source: https://www.industrydocuments.ucsf.edu/docs/mfy0000

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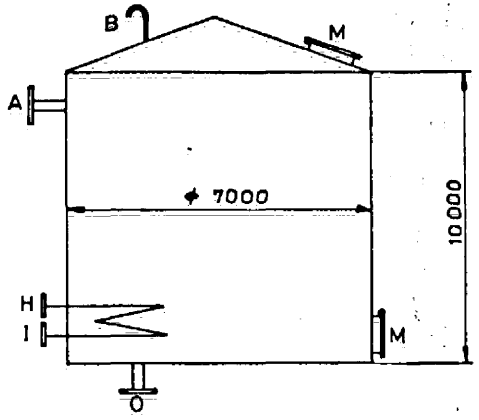
TECHNICAL DATA

ITEM NO. 2 pcs. 01-T-03 / 01-T-04

CONSTRUCTION NO.	-/-
TOTAL VOLUME	385 m³
OPERATING VOLUME	--
HEATING JACKET	--
MEDIUM	Corn sirup
OPERATING PRESSURE	
VESSEL	pressureless
HEATING JACKET	--
TEST PRESSURE	
VESSEL	0,5 bar
HEATING JACKET	--
MATERIAL	
VESSEL	carbon steel
HEATING JACKET	--
FLOWSHEET	4x/9513203 2x/9513226

SURFACE TREATMENT	
INTERNAL	Painted
EXTERNAL	Painted
INSULATION	
MATERIAL	--
MIN. TEMPERATURE	-- °C
MAX TEMPERATURE	-- °C
OPERATING TEMPERATURE	
VESSEL	15°C
HEATING JACKET	-- °C
OPERATING WEIGHT	app. 400 T
VESSEL WEIGHT, EMPTY	app. 16,5 T



ITEM:	SPECIFICATION	Nº PIECES	SIZE	REMARKS
A	PRODUCT INLET	1	NW 100	
B	AIR INLET	1	NW 80	
C	CLEANING NOZZLE	--	--	
D	AIR OUTLET	--	--	
E	SIGHT GLASS WITH LAMP	--	--	
F	OVERFLOW	--	--	
G	SIGHT GLASS	--	--	
H	HW INLET	1	NW 25	
I	HW OUTLET	1	NW 25	
K	INOCULATION - TRANSFER	--	--	
L	STAND GLASS	--	--	
M	MANHOLE	2	NW 500	
N	HANDHOLE	--	--	
O	BOTTOM - OUTLET	1	NW 32	
P	PI - MANOMETER	--	--	
Q	SAMPLE VALVE	--	--	
R	CHEMICALS	--	--	
S	STIRRER FLANGE	--	--	
T	LEVEL TRANSMITTER	--	--	
U	TI - THERMOMETER	--	--	
V	TEMP. TRANSMITTER	--	--	
W	pH TRANSMITTER	--	--	
X	AF - PROBE	--	--	
Y	AF - INLET	--	--	
Z	CIRCULATION	--	--	

PHILIP MORRIS

WA 19 041

A		D			
B		E			
C		F			

Tank 385 m³

GROUP NO. 01

SCALE NTS

DRWD BY	KV	11.7.80
CHECKED BY	WF	11.7.80
PROJ ENG		
PROC ENG		

PEC Process Engineering Company, CH 8708 Männedorf / Switzerland

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3.1 01-HE-01, 02

STERILIZATION PLANTS
FOR SEL EXTRACT 8% TS

Capacity 20 m^3/h

Equipment

1 balance type tank built in stainless steel

1 Nemo type feed pump 2ne30a, complete with variator and motor mounted on a common base plate

1 spiral heat exchanger type 1 for regenerative pre-heating/pre-cooling of the product

1 steam injector for final heating of the product to 130°C

1 spiral heat exchanger, for maintaining 5 minutes at 130°C

1 spiral heat exchanger type 1 for final cooling of the product with cooling water

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

1 plate type heat exchanger
for intermediate cooling of the circulating water during plant sterilization

1 set of valves and interconnecting pipes including all necessary bends, cones, couplings etc.

1 control panel for operating the plant.
The panel box is made of mild steel plate and painted.

It contains in the front:

- 2 temperature controllers
- 1 temperature recorder
- indicating lamps, push buttons and switches

It contains inside:

- relays, solenoid valves, fuses, guards, transformers, contactors and other necessary equipment for operating the plant

Steam consumption	approx.	800 kg/h
Cooling water 25°C	approx.	50 m^3/h

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

3.1 01-HE-03, 04

STERILIZATION PLANTS
FOR CORN SYRUP & WATER

Capacity 7,3 m^3/h

Equipment

1 balance type tank built in stainless steel

1 Nemo type feed pump 2ne30a, complete with variator and motor mounted on a common base plate

1 spiral heat exchanger type 1 for regenerative pre-heating/pre-cooling of the product

1 steam injector for final heating of the product to 130°C

1 spiral heat exchanger, for maintaining 5 minutes at 130°C

1 spiral heat exchanger type 1 for final cooling of the product with cooling water

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

1 plate type heat exchanger
for intermediate cooling of the circulating water
during plant sterilization

1 set of valves and interconnecting pipes including
all necessary bends, cones, couplings etc.

1 control panel for operating the plant.
The panel box is made of mild steel plate
and painted.

It contains in the front:

- 2 temperature controllers
- 1 temperature recorder
- indicating lamps, push buttons and switches

It contains inside:

- relays, solenoid valves, fuses, guards,
transformers, contactors and other necessary
equipment for operating the plant

Steam consumption approx. 800 kg/h
Cooling water 25°C approx. 50 m^3/h

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

ARCHIVE LOCATION VARIANCE SHEET

THE NUMBER (RANGE) 1003384144 IS LOCATED:

( ) IN THE AUDIO CABINET _____

( ) IN THE VIDEO CABINET _____

( ) ON THE OVERSIZE SHELF _____

( ) IN THE MICROFORMS CABINET _____

( ) AT THE WAREHOUSE _____

( ) IN THE TRANSLATION/TRANSCRIPTION FILES

_____

(X) OTHER _____

OVERSIZE DOCUMENT IN COLLECTION

1003384144

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

02

1003384145

1003384145

Source: https://www.industrydocuments.ucsf.edu/docs/hhyj0000

ITEM 02 - TF - 01

PURE CULTURE FERMENTOR

14 litre VOLUME

1003384146

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

MODULAR LABORATORY FERMENTOR SYSTEM

DESCRIPTION OF THE DIFFERENT MODULES

Drive module

The drive module consists of a rigid rectangular steel housing which can be placed - owing to its modest dimensions (900 x 400 x 200 mm - 35,43 x 15,75 x 7,88") - on any normal size laboratory table. It contains the direct current motor (0,5 kW) with flanged mitre-gear for the stirrer drive. The compulsory cooled motor is delivered suspended on the high-grade steel cover plate of the module housing. The stirrer can be adjusted to any speed between 0 and 800 rpm (0 - 1600 rpm if desired) by means of an electronic speed controller. An electric heating cartridge of 1,5 kW brings the temperature control of the fermentor within the temperature range of 20 - 50°C (68 - 122°F) in connection with a solid-state no-transit controller. The module contains the aeration group, consisting of the necessary aeration tubes, a control valve, a rotameter for aeration rates of 0,2 - 2 vvm, and a sterile inlet air filter. For the in-situ sterilization of the fermentor, the drive module can be connected to a steam tubing of max. 2 bar (30 psig) compressed air.

Supply figures

For operation of the laboratory fermentor

Electricity: Alternatively single-phase alternating current 50 cycles, 220 V, 15 A/ single-phase alternating current 60 cycles, 110 V, 30 A.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Air

dry, free of oil and dust 1 Nm3/h, 2 bar (30 psig) compressed air max.

Should the compressed air system have a higher rated pressure than 2 bar (30 psig), an adjustable pressure-reducing valve must be provided.

Steam

(only necessary for in-situ sterilization) Dry and free from mechanical impurities. 8 - 12 kg/h (17,6 - 26,4 lbs/h), depending on duration of sterilization. Pressure: max. 2 bar (30 psig)

Water

For temperature control and cooling after sterilization, cooling water of max. 18°C (64°F) for fermentation temperatures from 24°C (75°F), as free from chalk as possible, is needed. In areas with hard water (more than 12 German degrees of hardness), we recommend partial softening. We decline any liability for damage to the heating cartridge due to chalk deposits.

Quantity of cooling water: 400 l/h max. (cooling after sterilization)

Perfect operation of the temperature control is only ensured if the cooling water has a preliminary pressure of min. 1,5 bar (22 psig). For safety reasons (hoses), it is desirable to limit the max. pressure of the cooling water to 3 bar (45 psig).

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

The stirrer system for the standard unit comprises a four-leaf Rushton type turbine with adjustable blade positioning. Various other types of stirrer / aeration system may be fitted to this drive shaft, e.g. our Effigas ® unit or spin stirrer, by a simple procedure.

Although our glass fermentors are all tested for a sterilization pressure of 2 bar (30 psig) operating pressure, we recommend the use of our metallic protection cylinder for the in-situ sterilization (see optional extras).

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

14-LITRE FERMENTOR MODULE

The only connections which must be made to locate the interchangeable fermentor vessels are the cooling water inlet and outlet. A flexible coupling provides the connection from the helical toothed angular gear to the stirrer axis. The fermentation vessel itself has the following external dimensions, depending on its volume (incl. coupling and injection connection):

14 l (total volume)	diameter	300 mm (11,81")
	height	600 mm (23,62")

It consists of a bottom and a cover flange, between which a hardened glass cylinder is stretched by means of 4 drawbars. The bottom valve supports the stirrer bearing, consisting of two closed and permanently lubricated ball-bearings, the sterile sealing and the heating and baffle basket.

The sealing is made by the well-proven Chemap system, i.e. by means of a simple self-lubricating inner carbon/ceramic mechanical seal. The heating and baffle basket ensures an outstanding temperature control, as well as quick heating and cooling during sterilization, thanks to its generous exchange surfaces. The 14-litre fermentor cover has 12 well-proven Chemap standard injection connections for substrate feed, air, sampling or harvesting and for the mounting of 19 mm standard electrodes such as pH, Redox, dissolved oxygen.

An additional standard connection in the centre of the cover supports either the Reflux Cooler, combined with the outlet air filter, or the Mechanical Foam Separator Fundafom® size 00.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

ACCESSORIES

With the basic module described above you now have the basis of your universal fermentation system. Our extensive accessory programme allows you to extend your system according to your precise requirements.

Protection cylinder for the in-situ sterilization

The steel protection cylinder is mounted during in-situ sterilization on the cylindrical part of the fermentor module and prevents possible injuries to laboratory staff from glass fragments. We prescribe the use of this sensible accessory for any kind of in-situ sterilization, although all our fermentor modules are tested in our works for a sterilization pressure of 2 bar (30 psig). Transport damage or faulty reassembly of the fermentor module after cleaning can lead to stress in the hardened glass which can, in extreme circumstances, crack during the sterilization procedure.

Mechanical foam seoarator Fundafom ®, size 00

Based on our experience over many years with mechanical foam separators on industrial fermentors, we have now developed a foam separator for the laboratory fermentor with a separate motor. In this way we are free to choose the speed of the disc independently of the fermentor stirrer speed. Our Mini-Fundafom measures up to the most difficult foams. The motor (approx. 400 Watt) is protected against overload by a motor protective switch. The foam separator shaft runs in generously dimensioned ball-bearings. Any striking inbalance, caused by the naturally irregular foam of the disc nest is soon accomodated. A special mechanical seal for the Mini-Fundafom is provided to ensure an air- and water-tight shaft seal.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

The foam separator makes it possible to work with a fermentor filled completely with gas/liquid-dispersion and generally makes the use of chemical anti-foam agents superfluous. Due to this, one avoids not only the unwanted effects on the micro-organism growth, but can also attain a maximum reaction surface between the liquid and gas phase and therefore optimal oxygen transfer rates.

Injection needles

For sterile connections we employ, in combination with our standard injection connections, the universally adaptable PEC injection needles. Once a hose piece has been fitted on the quick-coupling, the hose end and the injection needle are secured in the usual manner with sterile hose and sterilization cord and the assembly sterilized in the autoclave.

In order to obtain a sterile connection, the first step is to ignite some alcohol in the standard injection connection slip-on; the sterilization hose is then removed from the needle end and the connection can be sterilized with the Bunsen burner. As basic equipment we recommend our economy-priced sets of 6 injection needles.

Peristaltic pump

For feeding, harvesting and also for pH control, we recommend the use of PEC's special peristaltic pumps. These pumps for 0 to max. 12,5 l/h are electronically adjustable to any speed and therefore dose rate. The speed control can either be adjusted from the pump itself through a 10-way potentiometer or by means of an external voltage regulation or a 10-speed servo-potentiometer. The direction of rotation of the pumps is reversible through a change-over switch. The dose rate reproducibility is approx. 2 %.

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INSTRUMENTATION

In order to obtain the best possible flexibility in parameter evaluation, we have combined frequently required instrument combinations into instrument modules in a 19" interpolation system. These instrumentation modules can be placed on the drive module adjacent to the fermentor.

Standard-type instrumentation modules

FZ 005

The following instruments can be fitted into the standard FZ 005 panel module:

- pH amplifier (output 0 to 20 mA)
- pH indicator, controller with limit contact and timer (output 220 V, 6 A)
- pO_2 amplifier (output 0 to 20 mA) to recorder
- temperature output signal from base panel to recorder
- foam probe amplifier
- foam probe limit switch (outout 220 V, 6 A) for anti-foam agent
- 6-point recorder
- 3-recorder tracks - spare

The instrument panel has been designed for the application of Chemap plug-in units which may be purchased progressively as required.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

DESCRIPTION OF THE SLIDE-IN UNITS

pH amplifier

The pH amplifier makes use, in its input stage, of a highly stable FET input operational amplifier (input-impedance higher than 10^{12}). This allows compensation for temperature, slope of the electrode and pH Zero-point-shift.

The instrument has two scales for a pH of 10, respectively 5 pH units. The amplifier output is 0 - 20 mA, at a maximum impedance of 400 Ohm.

Amplifier for dissolved oxygen

The oxygen amplifier is designed to work with an IL polarographic oxygen electrode. The electrode current (which is proportional to the partial pressure of the oxygen) is converted into a voltage and amplified. The instrument has 3 ranges, which enable the reading to be adapted to the specific need of the fermentation. The output signal is 0 - 20 mA at a maximum impedance of 400 Ohm.

Temperature amplifier

Temperature is measured by means of a Pt 100 standard resistor, which is fed by a constant current source from the Pt 100 amplifier. The signal is amplified and converted into a standard 0 - 20 mA output. The instrument has two ranges, namely 0 - 50°C (0 - 122°F) for fermentation and 0 - 150°C (0 - 212°F) for sterilization.

In automatic plant the range selection is also automatic.

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Rom read-out

The laboratory fermentor uses a DC motor. The rpm read-out signal is given by the armature voltage. Since this voltage is linearly proportional to the speed of rotation, it can be used for read-out via the AC indicator instrument.

Panel-meter with upper and lower set-point

In conjunction with all our amplifiers, we use our standard panel-meter slide-in unit. The two set-contacts may either be used for alarm triggering, or together with our timing circuit, a precision controller for pilot- and large-scaled fermentors may be assembled. The clearly readable scale is either 0 - 100 %, 2 - 12 pH, 0 - 150°C or 0 - 50°C.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

ITEM 02 - TF - 02

PRESEED FERMENTER

150 ltr VOLUME

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

CHEMAP ® P I L O T F E R M E N T O R P L A N T

150-litre Fermentor

FERMENTOR VESSEL

Our dimension-sheet FO 1481 shows the Fermentor Vessel with 150-litre total volume, and the drive motor mounted laterally to the base plate.

The vessel has a cover, and a double jacket on the cylindrical part for cooling / heating.

The cover is held down to the vessel by means of C-clamps and sealing is made with an O-ring.

The double jacket is used for feeding with direct steam during sterilization and for temperature control with water during the growing phase.

Total volume		150 litre
Working volume	approx.	100 litre

Dimensions:

Diameter of vessel	420 mm
Height of vessel	1240 mm

Working conditions:

Working pressure, vessel	3 bar/vacuum
Working pressure, heating jacket	3 bar/vacuum
max. working temperature, vessel	130°C

Material:

Parts in contact with product	stainless steel AISI 316
Jacket	stainless steel AISI 304

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Surface treatment

Parts in contact with product	surface grain 220
All other parts in stainless steel	pickled
Parts in mild steel	painted

Bottom dished end

- 1 flange for harvesting valve
- 1 flange for mounting the seal-bearing equipment

Inspection

SVDB (Schweizerischer Verein für Dampfkesselbesitzer) or as per your requirements

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

FERMENTOR COVER AND CONNECTIONS

Flat cover:

Connections on the cover:

- exhaust air connection on the Fundafom ® or on the central blind cover
- 4 needle connections for pH, anti-foam device
- 1 hand hole
- sterile pressure gauge
- bursting disc
- sight glass with illumination

Connections on the fermentor vessel top:

- 1 air inlet connection with by-pass
- 4 connections for: acid, alkali, anti-foam
- 1 connection for harvest valve

Connections on the cylindrical part:

5 standard connections for:

- pH electrode
- temperature probe
- pO_2 electrode
- sampling device

All unused connections are closed with blind plugs.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

BOTTOM DRIVE

The complete drive which includes the mechanical variator and the AC-motor are connected in a U-shape to the base plate. The power transmission is by means of two pulleys with power-grip-belts (timer belt wheels). In this way we can attain the lowest building height, while the vibrations are transmitted to the ground.

The main advantages of the bottom drive are:

a) the cover is free for other purposes such as Fundafom ® needle connections, etc.

b) there is less danger of infection, because water column on the seal part gives a steady pressure from the inside to the outside.

Mechanical variator

Motor:	AC-motor
Power	4 kW (5,5 HP)
Rpm	1500
Voltage	3 x 380 V 50 Cycle
Protection device	IP 44

Variator gear: (stepless)

Range	1 : 8
Rpm with the above range	100 - 800

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

MAIN SHAFT BEARING AND SEAL

The main shaft is held by means of two conical bearings. For sealing, we use a double mechanical seal ensuring an impeccable microbiological seal between the sterile media and the drive unit.

The unit consists of a sterilizable liquid chamber with compressed air system and a cooling jacket.

This arrangement has been used successfully for years.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

STIRRER SYSTEMS

Chemap ® Fermentors are designed for different uses. The stirrer systems are connected by means of a coupling to the drive side. In this way you can change each stirrer system easily. This construction has shown that we can change the stirrer systems for different micro-organisms and therefore the use of the fermentor is very wide.

Material:	stainless steel AISI 316
Surface treatment:	grained corn 220

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

HAND REGULATION AND INDICATION OF THE RPM

The rpm adjustment of the stirrer systems is done manually by a hand-wheel on the variator gear box.

The rpm can be read on the scale of the hand-wheel.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

AERATION

The pressure and amount of air can be pre-set with a pressure-reducing valve connected to a pressure gauge and on the needle valve. On the rotameter, the amount of air passing is controlled only by indication. After the rotameter, the air passes through the sterile filter into the fermentor sparger.

All the air sparger systems are constructed to give maximum distribution of air in the fermentor.

The sterile filter candles are made of ceramic. The great advantage of this material is that it can be sterilized in place with direct steam. For effective functioning of the sterile air filter, a pre-filter should be fitted if the steam and air are dirty. Other filters, e.g. Pall can be delivered.

The air exhaust from the fermentor passes through the mechanical foam breaker and the air outlet filter into the atmosphere.

The pressure in the fermentor can be regulated by a hand-valve placed at the end of the exhaust line.

The aeration system consists of:

- 1 pressure-reducing valve
- 1 rotameter, calibrated for 1 vvm
- 1 air inlet filter
- 1 air outlet filter
- differemt hand-valves and steam traps

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

FUNDAFOM ® MECHANICAL FOAM SEPARATOR

The addition of chemical anti-foam reagents leads to many disadvantages in the process, e.g. prolongation of the fermentation cycle, contamination of the fermentation end products and therefore difficulties during the isolation of those products. Apart from these considerations, we have to keep in mind that a fine emulsion in the reactor is highly desirable in order to maintain a large contact surface area between the phases. Furthermore, the purpose of the Fundafom ® foam separator is to separate effectively the used air phase from the liquid phase without any liquid being carried over into the effluent stream.

Construction

The Fundafom ® consists of a rotating hollow shaft on the bottom part of which, i.e. in the reaction vessel, conical discs are mounted. This portion of the shaft is perforated with a series of holes. Radial baffles are fitted to these discs to give a good breaking effect.

The drive shaft is sealed by means of a double mechanical seal which operates in exactly the same manner as the fermentor seal and is also connected to the condensate vessel of the fermentor seal. The Fundafom ® is driven separately by an electric motor and power is transmitted from the motor to the main shaft by means of tight belts.

Function

The Fundafom ® is mounted in the central hole of the fermentor cover. The gas and liquid mixture from the fermentor vessel flows into the separator cones and, due to the high velocity of the discs, the liquid is thrown back to the fermentor vessel. At the same time the lighter gas phase passes through the holes in the hollow shaft to the outside.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Size (type)		2
Rpm of the discs		1500
Diameter of the discs		225 mm
Exhaust tube		ND 34
max. gas capacity		1,8 m3/min.
Motor:	Power	4 kw / 5,5 HP
	Voltage	3 x 380V
	Frequency	50 Cycles
	Rpm	1500

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

ITEM 02 - TF - 03

SEED FERMENTER

4,5 m^3 VOLUME

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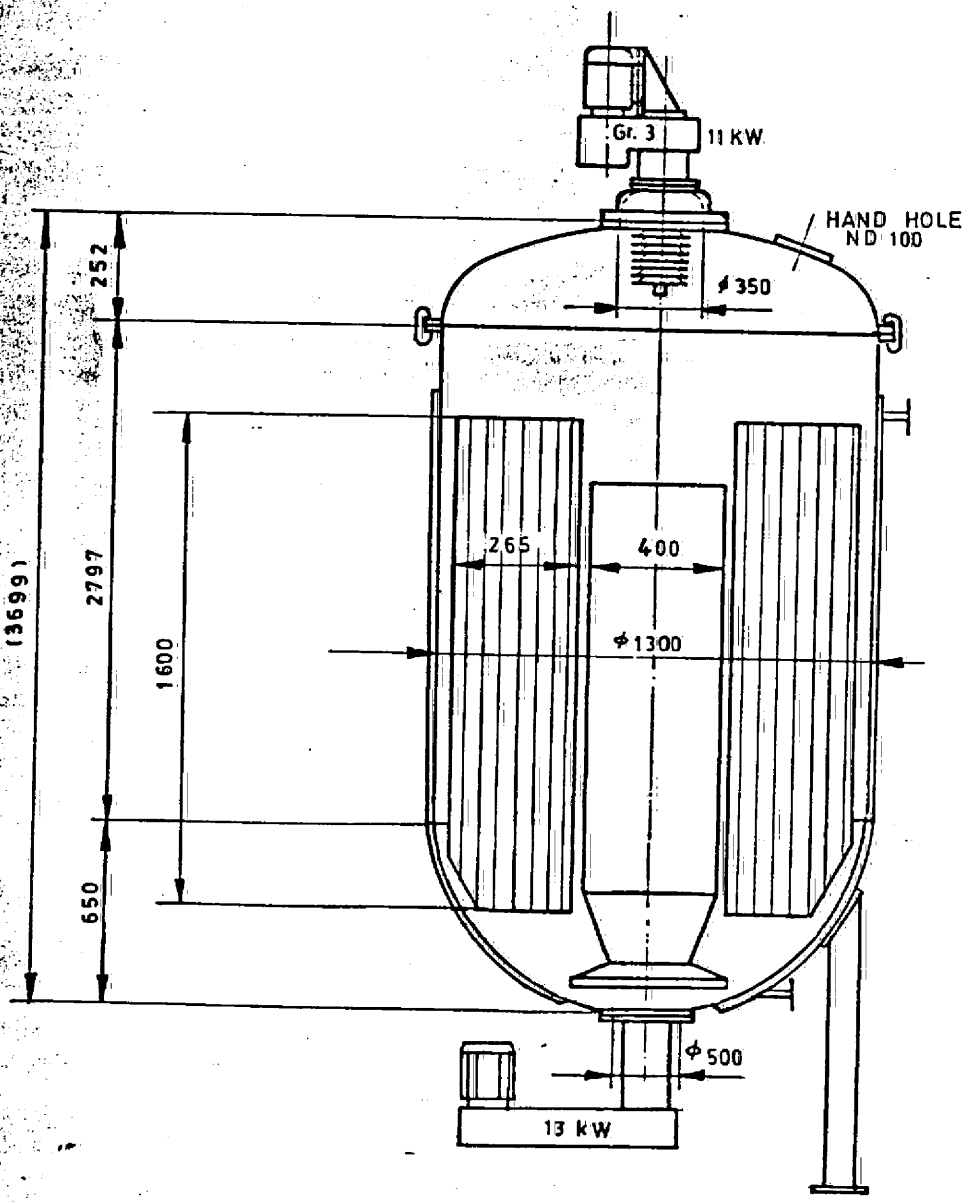
Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000



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Änderungen: a ..... d
b e
c f

Ersetzt durch:
Ersatz für:

FERMENTER 4,5 m³

Maßstab			
	Gezeichnet	14.7.80	Krüsch
	Geprüft		
	Normgeprüft		
	Gesehen		

PEC Process Engineering Company,
CH-8708 Männedorf, Switzerland

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

FERMENTER VESSEL (see dimension print No. 3-951'3266)

Total volume	4,5	m3
Liquid volume	2,3	m3

Dimensions

Diameter	1300	mm
Height of vessel	3699	mm
Height with foam breaker	4670	mm
Total height from floor level	5700	mm

Material

in contact with liquid	1.4435
other parts (legs, etc)	Carbon steel

Construction data

Design pressure	4 bar
Operating pressure	3 bar
Design temperature	130 °C
Operating temperature	ambient to 130° C

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

HEATING / COOLING ELEMENTS

To carry away 33'342 kcal/h, 8 heat exchanger baffles are necessary. Dimensions: 265 mm x 1600 mm.

For the cooling water feed of the baffles, a ring pipe has to be installed into the fermentor for the outlet side.

The baffles must have a capacity for heat prolongation. As we have already installed several fermentor plants with this heat exchanger, we can provide all necessary information in case of order.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

MECHANICAL FOAM BREAKER "FUNDAFOM" ®

(see sketch FO 1527a)

The addition of chemical anti-foam solution has many disadvantages, e.g. prolongation of the fermentation time, impurity and difficulty during preparation of the Ninomass after fermentation. The mechanical foam breaker "Fundafom" allows separation of the foam into a liquid and gas phase also when working with high air capacities. The Fundafom is protected by patents of our firm.

Construction

The Fundafom consists of a rotating hollow shaft on the bottom part of which, i.e. in the reaction vessel, conical discs are mounted. This portion of the shaft is perforated with a series of holes. Radial baffles are fitted to these discs to give a good breaking effect.

The drive shaft is sealed by means of a double mechanical seal which operates in exactly the same manner as the fermentor seal and is also connected to the condensate vessel of the fermentor seal. The Fundafom is driven separately by an electric motor and power is transmitted from the motor to the main shaft by means of tight belts.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Function

The Fundafom is mounted in the central hole of the fermentor cover. The gas and liquid mixture from the fermentor vessel flows into the separator cones and, due to the high velocity of the discs, the liquid is thrown back to the fermentor vessel. At the same time the lighter gas phase passes through the holes in the hollow shaft to the outside.

Size (type)	3
Speed of the discs	1000 rpm
Diameter of the discs	330 mm
Exhaust tube	80 mm
Max. gas capacity	300 m^3/h

Motor (Australian delivery):	Power	11 kW
	Voltage	as required
	Frequency	as required
	Rom	1500 rpm at 15 cy.

For further information see attached Fundafom ® catalogue.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

CIRCULATION STIRRER WITH DRAFT TUBE, EFFIGAS® SYSTEM

(see special description "Effigas")

The mixing principle is based on a closed liquid transfer from the bottom to the top of the fermentor vessel. The air inlet is placed on the suction side of the impeller. A special baffle device prevents rotation of the liquid and is placed around the impeller. If the fermentation needs a high emulsifying effect, an emulsifying ring can be placed between the impeller and the baffle device. According to the input power and the rpm, the liquid volume in the vessel can be displaced as the calculation shows.

The draft tube stirrer system consists of:

- 1 impeller 400 mm
- 1 central tube
- 1 air sparger

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyf0000

MAIN SHAFT BOTTOM SEAL

We use a double mechanical seal which ensures a clean and safe biological barrier between the sterile media and the drive unit. The unit has a sterilizable liquid chamber and a cooling jacket. To overpressurize the mechanical seal with sterile liquid (condensate), the fermentor is equipped with a condenser vessel. The cooling of the seal is maintained during operation by this condensate-holding vessel. This sterile condensate is kept in circulation by means of a pump.

The main shaft bottom seal consists of:

- 1 double mechanical seal
- 1 condensate vessel
- 1 pressure-reducing valve
- 1 air filter
- different manual valves
- 1 steam trap

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Temoerature control

The temperature in the fermentor is measured by means of an electric temperature probe. The probe is located on the lower part of the cylindrical vessel. The output of the probe is fed to a controller with proportional-integral function and at the same time connected to the 6-point recorder.

The controller output operates the cooling water valve. A manual override is provided to allow independent adjustment.

Temperature control is carried out in a closed system, circulating water through the baffles of the fermentor. If a deviation to the set-point of the temperature is registered, the necessary control valve will immediately be operated automatically, to feed cooling water.

Sterilization

Sterilization is done manually.

The temperature control consists of:

- temperature probe PT 100
- connection to the 6-point recorder

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

pH CONTROL

The pH control corrects automatically on the acid and base side.

The pH is measured by means of a steam-sterilizable combination electrode. The probe is located on the lower part of the cylindrical vessel. The output of the probe is amplified and recorded on the 6-point recorder. At the same time the signal is fed to the controller which has an injection time and a dead time which can be regulated. The set-point of the pH value is automatically controlled and remains constant. By changing the set-point on the controller, the pH can be varied.

The pH control consists of:

- 1 pH electrode
- 1 amplifier
- 1 connection to the 6-point recorder
- 1 impulse regulator
- 2 pneumatic valves

Dosing of acid and base by means of 2 pneumatic valves.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Chemical antifoam device

A foam-probe, Teflon coated, is located in the cover of the fermenter. The probe is adjustable in height. As soon as the tip of the probe contacts foam a signal is amplified and a timer system regulates the metering pump for the addition of antifoam liquid.

The chemical antifoam device consists of :

- foam probe
- amplifier
- electronic impulsator

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

pO_2 MEASUREMENT AND CONTROL

With the new system, it is possible to measure the dissolved oxygem in the fermentor. The pO_2 probe can be sterilized in the autoclave or in place in the fermentor. The anode consists of a platinum wire and the cathode is made of silver/silver chloride. A KCl - Methyl-Cellulose-Gel is used as the electrolyte. The membrane is made of a stainless steel screen, coated with a silastic component. The membrane can be used for several sterilizations without changing the measuring point. After 10 sterilization cycles, the membrane may have to be changed by removing the cao. The signal from the probe is amolified and fed to the 6-point recorder and to the electro-pneumatic converter. The location of the pO_2 electrode is in the lower part of the cylindrical vessel.

The output signal is fed to the controller which regulates the control valves of the O_2 or N_2 feed into the fermentor. These control valves are located directly on the rotameters and regulate the O_2 or N_2 capacity. An indication is given on the rotameters. The airfeed into the fermentor is fixed manually. The instrument shows the effective pO_2 partial pressure in the fermentation broth and is also registered on the 6-point recorder.

The pO_2 control system consists of:

- 1 pO_2 electrode with membrane
- 1 amolifier
- 1 connection to the 6-poimt recorder
- 2 electro-pneumatic converters
- 2 pneumatic controllers
- 2 control valves

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

CONTROLS

Control panel for manually operated plants

The control panel contains only the amplifiers, controllers, recorders and switches for the parameters which have to be measured or controlled. The instruments are mounted and the cabinet is completely wired and ready for operation. All the valves in the plant are manually operated, excluding the regulation valves.

The control panel consists of:

- 1 standard cabinet
- wiring and mounting of the amplifiers, controllers, recorders and switches of the parameters which are measured or controlled.

All the instruments are tested and ready for operation.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

10033841 80

ultrafilter air sterilisation and steam filters.

02-FA-01
02-FA-02
02-FA-03

ultrafilter sterilisation filters for 100% sterile compressed air or gases

ultrafilter steam filters, 100% efficient at 30 micron pore size

Type SRF – air sterilisation reverse flow D – Steam filter	Capacity at 7 bar line pressure Nm³/h (minimum measurement)	Nm³/h (maximum measurement)	Connections B ex radius	Dimensions in mm Length A	Width B	Height to connection C	Length of bow D	Weight in kg
0005	30	40	R ¼" R ⅜"	226	Ø 110	40	140	2
0007	45	60	R ⅜"	226	Ø 110	40	140	2,5
0010	60	80	R ½"	226	Ø 120	46	140	3
0015	90	120	R ¾"	238	Ø 120	54	140	3,5
0020	120	160	R 1"	268	Ø 140	54	170	4
0030	150	200	R 1¼"	312	Ø 160	65	180	5,5
0060	320	400	R 1½"	440	Ø 160	65	310	6,5
0090	480	600	R 2"	552	Ø 170	65	420	7,5
0120	640	800	R 2½"	732	Ø 299	94	560	21
0160	960	1200	R 3"	986	Ø 200	94	800	23
0240	1440	1800	R 3"	998	Ø 240	110	800	25

Type 0005 to 0240 housings are stainless steel 1.4301. Adapter for milk type screw connections to DIN 11 851 and screw-in flanges available at extra cost.

0320	1920	2400	NW 100	900	410	750	580	80
0480	2880	3600	NW 100	1170	410	1020	650	90
0640	3840	4800	NW 150	1270	490	1090	675	130
0960	5760	7200	NW 150	1320	540	1100	675	150
1280	7680	9600	NW 200	1410	660	1170	675	236
1600	9600	12000	NW 200	1430	660	1170	675	240
1920	11520	14400	NW 250	1520	800	1230	675	376
2560	15360	19200	NW 250	1540	800	1230	675	380
3200	19200	24000	NW 300	1640	930	1300	675	530

Type 0320 to 3200 housings are galvanised steel. All internal parts and outlet surfaces are in stainless steel 1.4301. All stainless steel housings are available at extra cost.

Type	Pressure differential in bar in clean condition
SRF	0.07

* capacity for steam filters in kg/h at 120°C.

Prefilter
The use of prefilters is recommended where heavy contamination of oil, water and dirt should be installed to clean the steam used during the sterilisation cycle

Drying
For all sterile applications the air MUST be moisture free & dryer is recommended.

Steam sterilisation
ultrafilter air sterilisation filter elements can be steam sterilised in-situ with steam up to 200°C.

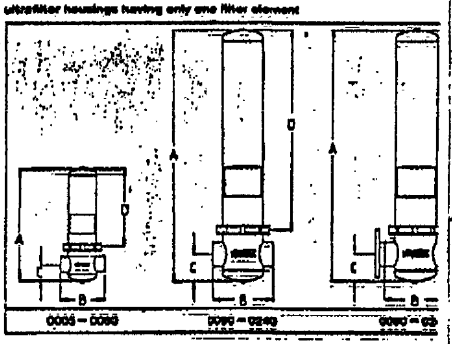
Maintenance
The filter elements should be changed when the differential pressure reaches 1 bar or earlier to suit your own preventive maintenance routines. The filter elements can be changed

Explanation
The capacities quoted in the table are for a line pressure of 7 bar. At other pressures the volumetric flow changes, the higher the pressure, the higher the permissable flow rate – see the table on the next page for details.

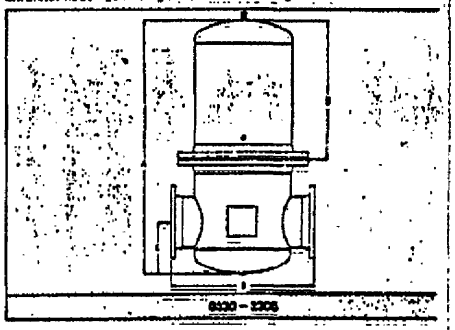
Filter element		Number per stage
3/1	with threaded connection	1
3/1,5		1
4/1,5		1
4/2,5		1
5/2,5		1
5/3		1
10/3		1
15/3		1
29/3		1
30/3		1
30/5		1

29/3-3	with flange connections	3
30/3-3		3
30/3-4		4
30/3-6		6
30/3-8		8
30/3-10		10
30/3-12		12
30/3-16		16
30/3-20		20

ultrafilter housings having only one filter element



ultrafilter housings having multi-element arrangements



Conversion table									
Working pressure	1	2	3	4	5	6	7	8	9
Conversion factor x	0.25	0.36	0.5	0.6	0.75	0.90	1	1.1	1.2

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

SEED LINE	GROUP NO. 02	OFFER NO.	WA: 19'041
PHILIP MORRIS SCHWEIZ		ORDER NO.	PAGE: 1

ITEM	PIECE	SPECIFICATION	kW	MAT.	SIZE / CAP.	REMARKS
TF-01	1	Labor fermenter complett	1,5	SS	14 l	Fully equipped incl. control
TF-02	1	Pilot plant complett	16	SS	150 l	Fully equipped incl. control
TF-03	1	Seed fermenter complett	24	1.4435	4,5 m^3	Fully equipped incl. control
T -04	1	Storage tank	-	1.4401	20 l	For Antifoam
T -05	1	Storage tank	-	Hastelloy	50 l	For KOH
T -06	1	Storage tank	-	1.4401	500 l ?	For ACID
FA-01	1	Air filter	-	1.4301	15 Nm^3/h	Sterile
FA-02	1	Air filter	-	1.4301	15 Nm^3/h	Sterile
FA-03	1	Air filter	-	1.4301	15 Nm^3/h	Sterile
FA-04	1	Air strainer	-	1.4301	0-100 l/m	

p.e.c.	DATE: 11.7.80	CHECKED BY: W. Frei	NO: 4-951 3227 / 1

1003384181

1003384181

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

ARCHIVE LOCATION VARIANCE SHEET

THE NUMBER (RANGE) 1003384182 IS LOCATED:

( ) IN THE AUDIO CABINET _____

( ) IN THE VIDEO CABINET _____

( ) ON THE OVERSIZE SHELF _____

( ) IN THE MICROFORMS CABINET _____

( ) AT THE WAREHOUSE _____

( ) IN THE TRANSLATION/TRANSCRIPTION FILES

_____

(X) OTHER _____

OVERSIZE DOCUMENT IN COLLECTION

1003384182

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CHEMICALS		GROUP NO. 03	OFFER NO.	WA: 19'041
PHILIP MORRIS SCHWEIZ			ORDER NO.	PAGE:

ITEM	PIECE	SPECIFICATION	kW.	MAT.	SIZE / CAP.	REMARKS
TM-01	1	Mixing tank	1,5	CS	1m^3	For KOH
T -02	1	Tank	-	CS	10m^3	For ACID epoxy painted
TM-03	1	Mixing tank	1,5	1.4301	1m^3	For ANTIFOAM
TM-04	1	Mixing tank	1,5	1.4301	1m^3	For ANTIFOAM Stand by
FA-01	1	Air filter	-	1.4301	21,6 Nm^3/h	Sterile
FA-02	1	Air stranger	-	1.4301	0-100 l /m	
FA-03	1	Air filter	-	1.4301	21,6 Nm^3/h	Sterile

p.e.c.	DATE: 11.7.80	CHECKED BY: W. Frei	NO. 4-951 3228 / 1

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10033841 84

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

To ITEM 02 - TM - 01

1 VIBROMIXER, Model E-3

System Dr. Eng. Hans Müller

For mixing capacities of 50 to 800 litres

Operating temperature 130°C

Operating pressure 5 bar

Function

In contrast to the classical rotary agitator, the Vibromixer operates on a reciprocating action. The vibrating device is driven by standard AC current. The immersed mixing device vibrates on a vertical plane. The mixing effect is based on the Bernoulli effect and ensures a thorough but nevertheless gentle mixing.

Technical data

Drive:

Electro-magnetic vibrating drive in a housing made of an Al-Alloy, protection class P 33, SEV tested.

with:

- central suspension made of rubber straps
- stirrer coupling
- 2-step switch for wall mounting and 1,5 m cable

Vibration frequency:	60 Hz
Voltage:	220 V

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10033841185

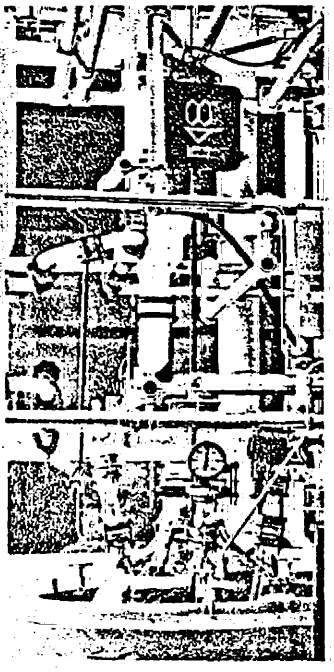
Source: https://www.industrydocuments.ucsf.edu/docs/nhyl0000

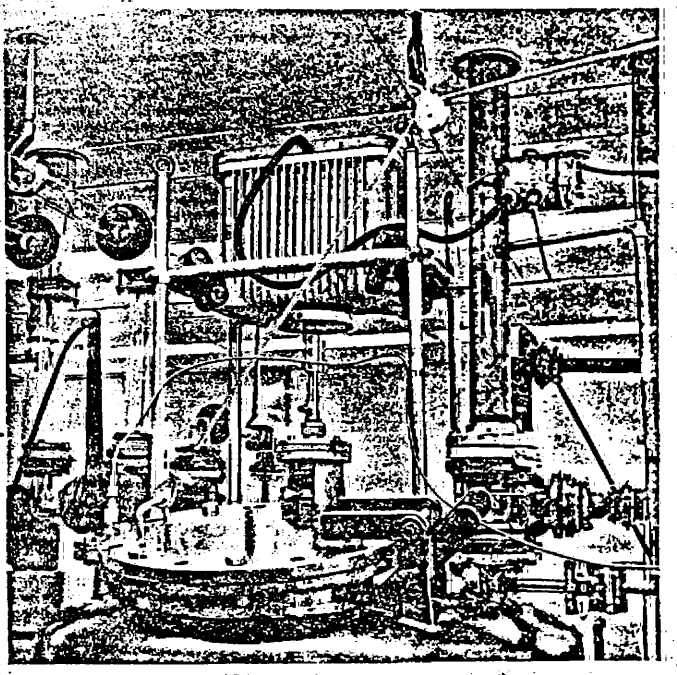
To Pos. TM-01

VIBRO-Mischer Industriemodelle E 2, E 3, E 4

VIBRO-Mélangeurs industriels, types E 2, E 3, E 4

VIBRO-Mixers for Industry, Models E 2, E 3, E 4





VIBRO-Mischer werden mit Vorteil in jedem Industrieverfahren eingesetzt, in welchem Rühren, Mischen, Auflösen, Homogenisieren, Emulgieren oder Dispergieren erforderlich ist.

Typ	Mischleistung (für nicht-viskose Flüssigkeiten)
E-2	10 - 150 lt.
E-3	50 - 800 lt.
E-4	500 - 50'000 lt.

Les vibro-mixers peuvent être utilisés avantageusement dans tout procédé industriel comportant des opérations d'agitation, de mélange, de dissolution, d'homogénéisation, d'émulsion ou de dispersion.

Type	Capacité de mélange (pour liquides non visqueux)
E-2	10 - 150 l.
E-3	50 - 800 l.
E-4	500 - 50'000 l.

VIBRO-Mixers can be employed to advantage in any industrial Process involving stirring, mixing, dissolving, homogenising emulsifying or gas dispersion.

Model	Mixing Capacity (non - viscous liquids)
E-2	10 - 150 litres
E-3	50 - 800 litres
E-4	500 - 50'000 litres

Chemap AG

CH-8708 Männedorf, Switzerland
Alte Landstrasse 415, P.O. Box
Telephone: 01 9221101, Telex: 75508
Cables: Servochemie Männedorf

Printed in Switzerland h 562

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10003841 86

Source: https://www.industrydocuments.ucsf.edu/docs/mhyl0000

Technische Beschreibung

Diese Mischleistung variiert zwangsläufig mit der Viskosität und Konsistenz des Mediums. Die obere Grenze des Wirkungseffektes liegt etwa bei 6°E. Ein Rührer aus V4A (P-1 für Flüssigkeitsbewegungen aufwärts; P-2 mit nach unten gerichteter Flüssigkeitsbewegung) wird zu jedem VIBRO-Mischer mitgeliefert. Für hochkorrosive Medien sind ebonitierte oder kunststoffvermeidete Rührer erhältlich. Die vertikale Amplitude des Rührers wird mittels eines 2-Stufen-Schalters eingestellt, oder proportional mit einem variablen Transformator. VIBRO - Mischer verbrauchen wenig Energie. Der grösste Typ, Modell E-4 benötigt nur 4,6 A. Der VIBRO-Mischer hat keine rotierende Teile, und weist weder Führungen noch Lagerungen auf. Das Wirkungsprinzip ist demdes Labormodells E-1 gleich. VIBRO-Mischer eignen sich gleich gut für offene wie geschlossene Behälter. Industrie - VIBRO - Mischer werden einfach über einem offenen Gefäss an einem Haken aufgehängt. Für den E-4 ist ein Rahmengestell erhältlich, falls für eine normale Aufhängung nicht genügend Platz vorhanden ist. Für das Arbeiten in geschlossenen Behältern wird ein geflanschtes Membran - Abschlussorgan auf den Behältern montiert. Der Rührer wird durch die Membrane, welche aus korrosionsfestem Material gefertigt ist, in den Kessel geführt. Drei Typen Abschlussorgane sind erhältlich:

Niederdruck-Abschlussorgan, Typ ND
Ein einfacher Membranabschluss für Arbeitsdrücke bis 0,3 atü. Bei ausgeschaltetem VIBRO-Mischer kann die Membrane während des Zurückdrückens oder Ablassens des Mediums bis 2 atü belastet werden. Spezifikationsblatt 001169 enthält sämtliche Details und wird auf Anfrage gerne zugesandt.

Standard-Abschlussorgan, Typ ND
Dieses Membran-Abschlussorgan arbeitet mit voreingestelltem Feder - Gegendruck bis 5 atü oder Vakuum. (Für Details verlangen Sie bitte Spezifikationsblatt 002024).

Hochdruck-Abschlussorgan, Typ HD
Garantiert hermetischer Abschluss bis 100 atü für Mengen bis 50 lt. Für grössere Mengen (max. 100 lt.) bis 50 atü. (Spezifikationsblatt 001408).

Warnkammer: Eine zusätzliche Sicherheitsvorrichtung zwischen Behälter und Abschlussorgan.

Description technique

Cette capacité de mélange varie nécessairement en fonction de la viscosité et de la consistance du milieu. Les vibro-mixers restent efficaces jusqu'à une viscosité de 70 cps. Avec chaque vibro-mixer est fourni un agitateur (P1 pour agitation du liquide vers le haut, P2 avec mouvement d'agitation dirigé vers le bas). Les agitateurs sont en acier inoxydable (18/8/2,5) et dans le cas d'un milieu fortement corrosif, des agitateurs revêtus d'ébonite ou de plastique peuvent être fournis.

L'amplitude verticale de l'agitateur peut être réglée par un commutateur à 2 positions, ou progressivement par un transformateur variable.

Les vibro-mixers nécessitent peu d'énergie. Le plus grand modèle, E-4, ne nécessite que 4,6 A.

Le vibro-mixer ne comporte aucune partie tournante etne nécessite ni guide, ni roulement et n'a pas besoin d'être lubrifié. Le principe d'action est semblable à celui du vibro-mixer modèle E-1 de laboratoire. Les vibro-mixers agissent aussi bien en réservoirs ou récipients ouverts que fermés.

Les vibro-mixers industriels sont simplement suspendus à un crochet au-dessus d'un réservoir ouvert. Dans le cas où l'on ne dispose pas d'une place suffisante pour suspendre le modèle E-4, on peut le monter sur un cadre de suspension spécial. Si l'on veut utiliser les vibro-mixers en récipients fermés, il faut monter un système d'obturation à membrane avec bride.

Obturateur basse pression - type BP
Un simple obturateur à membrane utilisé pour des pressions jusqu'à 0,3 bars. Lorsque le vibro-mixer est arrêté, la membrane peut supporter une pression de 2 bars pendant les opérations de vidange ou de purge. La feuille de spécification 001169 donne tous les détails y relatifs et sera envoyée sur simple demande.

Obturateur standard - type BP
Cette membrane à ressorts est destinée à être utilisée pour des pressions jusqu'à 5 bars. (Pour tous les détails se référer à la feuille de spécification 002024).

Obturateur haute pression - type HP
Garantit l'étanchéité jusqu'à 100 bars pour des capacités allant jusqu'à 50 litres. Pour des capacités plus grandes (max. 100 l.) jusqu'à 50 bars. (Feuille de spécification 001408).

Chambre de sécurité: dispositif supplémentaire de sécurité entre le récipient et l'obturateur.

Technical Description

These mixing capacities necessarily vary according to the viscosity and consistency of the medium. VIBRO-Mixers operate efficiently with viscosities up to 70 cps.

A stirrer, P-1, to direct the main flow upwards, or P-2, to direct the main flow downwards, is supplied with each VIBRO-Mixer. The stirrers are of stainless steel 316 (18/8/2,5) and, for highly corrosive applications can be supplied with hard-rubber or plastic coating.

The vertical amplitude of the stirrer is controlled by a two-step switch or progressively, by a variable output transformer.

VIBRO-Mixers consume little power, only 4,6 amp. are required for the largest model, E-4.

The VIBRO-Mixer has no rotating parts, no guides and no bearings, and needs no lubrication. The principle of operation is the same as for the VIBRO-Mixer E-1. VIBRO-Mixers operate equally well in open or closed vessels and tanks.

The industrial VIBRO-Mixers are simply hung from a hook over open vessels. Where there is not sufficient space for an E-4 model to be hooked overhead, a suspension frame is available to support it.

To use VIBRO-Mixers in closed tanks, a flanged membrane seal, of durable, corrosion-resistant material, is fitted to the stirrer, which is inserted at the top of the tank. Three types of seals are available:

Low pressure seal; type DL
A simple membrane seal for use at working pressures up to 5 psig (0.3 ato). When the VIBRO-Mixer is not in operation, the seal will serve to discharge or feedback at pressures up to 30 psig (2 ato). Specification sheet 001169 gives full details and will be sent on request.

Standard pressure seal; type ND
This spring-balanced seal is for use at pressures up to 75 psig (5 ato), or for corresponding negative pressures. (Specification 002024).

High pressure seal, type HD
Guarantees hermetical sealing for quantities of 50 litres or less, at pressures up to 1500 psig (100 ato). For larger quantities, up to 100 litres, these seals can be supplied for working pressures of 750 psig (50 ato). (Specification sheet 001408).

Guard Chamber: A safety device for installation between the vessel and seal.

The Chemap Group:
Chemap AG, CH-8708 Männedorf, Switzerland
PEC, Process Engineering Company, Switzerland
Chemap GmbH, D-403 Ratingen, FR Germany

Chemapec Inc., Woodbury, N.Y. 11797, USA
Chemapec S.A.R.L., F-69500 Bron, France
PEC, D-8022 Grünwald, FR Germany
Chemapec (PTY) Ltd., Johannesburg, S. Africa

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

10033841 88

ultrafilter air sterilisation and steam filters.

02-FA-01
02-FA-03

ultrafilter sterilisation filters for 100% sterile compressed air or gases

ultrafilter steam filters, 100% efficient at 30 micron pore size

Type SRF = air sterilisation reverse flow D = Steam filter	Capacity at 7 bar line pressure Nm³/h Minimum	Nm³/h Maximum	Connections R = radius	Dimensions in mm length A	width B	height to connection C	length of bowl D	Weight in kg
0005	30	40	R ¼" R ⅜"	226	Ø110	40	140	2
0007	45	60	R ⅜"	226	Ø110	40	140	2.5
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0015	90	120	R ¾"	238	Ø120	54	140	3.5
0020	120	160	R 1"	268	Ø140	54	170	4
0030	160	200	R 1¼"	312	Ø160	65	180	5.5
0060	320	400	R 1½"	440	Ø160	65	310	6.5
0090	480	600	R 2"	552	Ø170	65	420	7.5
0120	640	800	R 2½"	732	Ø200	94	560	21
0160	960	1200	R 3"	986	Ø200	94	800	23
0240	1440	1800	R 3"	998	Ø240	110	800	25

Type 0005 to 0240 housings are stainless steel 1.4301. Adaptor for milk type screw connections to DIN 11851 and screw-in flanges available at extra cost.

0320	1920	2400	NW 100	900	410	750	580	80
0480	2880	3600	NW 100	1170	410	1020	850	90
0640	3840	4800	NW 150	1270	480	1090	875	130
0960	5760	7200	NW 150	1320	540	1100	875	150
1280	7680	9600	NW 200	1410	660	1170	875	236
1600	9600	12000	NW 200	1430	660	1170	875	240
1920	11520	14400	NW 250	1520	800	1230	875	376
2560	15360	19200	NW 250	1540	800	1230	875	380
3200	19200	24000	NW 300	1640	930	1300	875	530

Type 0320 to 3200 housings are galvanised steel. All internal parts and outlet surfaces are in stainless steel 1.4301. All stainless steel housings are available at extra cost.

Type	Pressure differential in bar in clean condition
SRF	0.07
* capacity for steam filters in kg/h at 120°C.	

Prefilter
The use of prefilters is recommended where heavy contamination of oil, water and dirt should be installed to clean the steam used during the sterilisation cycle.

Dryers
For all sterile applications the air MUST be moisture free a dryer is recommended.

Steam sterilisation
Ultrafilter air sterilisation filter elements can be steam sterilised in-situ with steam up to 200°C.

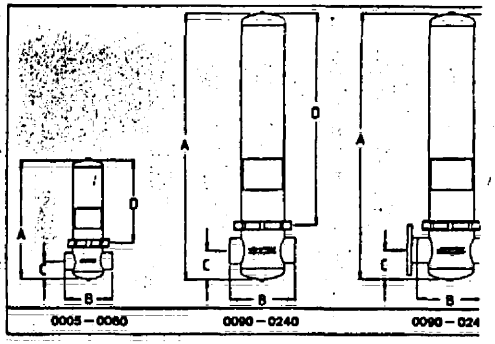
Maintenance
The filter elements should be changed when the differential pressure reaches 1 bar or earlier to suit your own preventive maintenance routines. The filter elements can be changed

Explanation
The capacities quoted in the table are for a line pressure of 7 bar. At other pressures the volumetric flow changes, the higher the pressure, the higher the permissable flow rate - see the table on the next page for details.

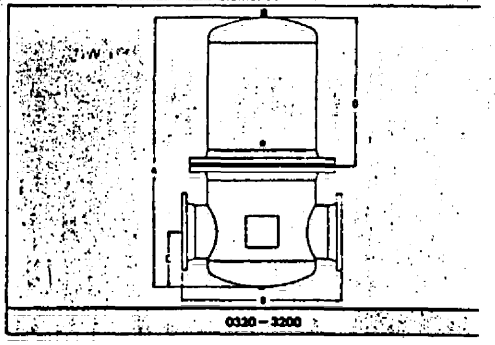
Filter element		Number per stage
3/1	with threaded connection	1
3/1.5 *		1
4/1.5		1
4/2.5		1
5/2.5		1
5/3		1
10/3		1
15/3		1
20/3		1
30/3		1
30/5		1

20/3-3	with flange connections	3
30/3-3		3
30/3-4		4
30/3-6		6
30/3-8		8
30/3-10		10
30/3-12		12
30/3-16		16
30/3-20		20

ultrafilter housings having only one filter element



ultrafilter housings having multi-element arrangements



Conversion table

Working pressure	1	2	3	4	5	6	7	8	9	1
Conversion factor x	0.25	0.36	0.5	0.6	0.75	0.90	1	1.1	1.2	

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Source: https://www.industrydocuments.ucsf.edu/docs/nhyl0000

02-FA-02

spirax sarco

Schmutzfänger Typ 14
¼" bis 2" ND 40
aus Stahl

Einsatzbereich

max. Betriebsüberdruck/Temperatur:
42 bar bei 450°C
82 bar bei 110°C

Dieser Einsatzbereich wird in einigen Ländern durch Normen eingeschränkt.

Für Deutschland und die Schweiz gelten folgende Einsatzgrenzen:
21 bar bei 400°C
32 bar bei 250°C
40 bar bei 120°C

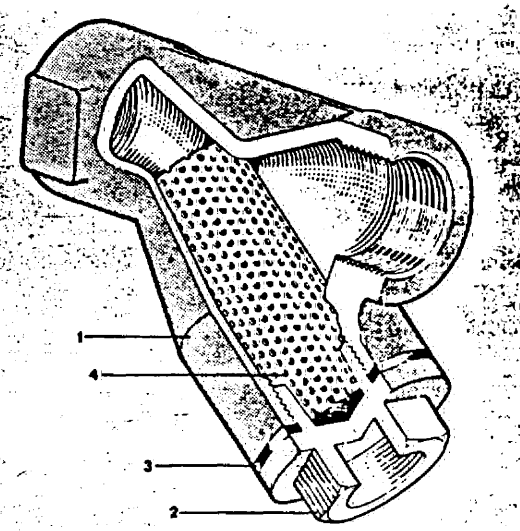
Anschlüsse

Muffenanschlüsse mit zylindrischem Innengewinde nach DIN 2999 (API-Gewinde auf Anfrage) oder Einsteckschweißmuffen je nach gewünschter Norm.

Werkstoffe

	Bauteil	Werkstoff
1	Gehäuse ¼" bis ½"	Schmiedestahl
	¾" bis 1"	Stahlguß
2	Siebhaltestopfen	
	¼" bis 1"	Schmiedestahl
	1¼" bis 2"	Stahlguß
3	Dichtung	Asbest graphitiert
4	Sieb	Edelstahl rostfrei

Ersatzteile siehe Rückseite



Siebe

Lochsieb (Normalsieb) : 0,8 mm Lochdurchmesser
Drahtsieb (Feinsieb) : 0,16 mm Maschenweite (100 mesh), kann auf Wunsch gegen Mehrpreis geliefert werden.

Maße, Gewichte

Größe	Maße in mm A	B	C	D	Gewicht in kg
¼"	70	51	80	22	0,43
⅜"	70	51	80	24	0,49
½"	73	52	81	32	0,56
¾"	90	64	100	36	0,72
1"	105	74	120	46	1,17
1¼"	140	102	164	60	2,35
1½"	152	115	184	70	3,30
2"	178	138	224	80	4,95

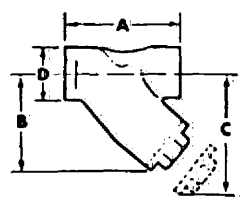
Bestellnummern, k_{VS}-Werte

Größe	Bestellnummer Innengewinde	Einsteckschweißmuffen	k_{VS}-Wert m^3/h
¼"	4040.008	4070.008	2,5
⅜"	4040.010	4070.010	3
½"	4040.015	4070.015	3,5
¾"	4040.020	4070.020	11
1"	4040.025	4070.025	15
1¼"	4040.032	4070.032	25
1½"	4040.040	4070.040	40
2"	4040.050	4070.050	66

Ausblasebohrung

Auf Wunsch kann der Siebhaltestopfen gegen Mehrpreis mit einer Gewinde-Bohrung zum Anbringen eines Ausblase- oder Ablaßventiles versehen werden.

Größen ¼" ... ½" : Gewinde-Bohrung ⅛"
Größen ¾" ... 1" : Gewinde-Bohrung ¼"
Größen 1¼" ... 1½" : Gewinde-Bohrung 1"
Größe 2" : Gewinde-Bohrung 1¼"



Service Abstand

Änderungen vorbehalten

SPIRAX SARCO AG 8032 Zürich
Zollikerstrasse 27 Tel 01/ 34 27 27

4.8.75. DB 545/1 CH

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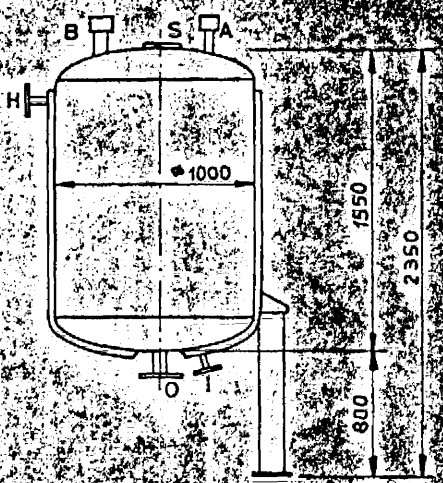
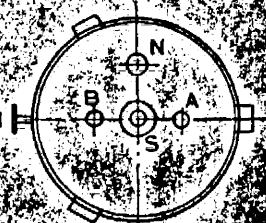
Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000





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Urheberschutz n. VSM 10318

TECHNICAL DATA

CONSTRUCTION NO.	
TOTAL VOLUME	
OPERATING VOLUME	
HEATING JACKET	
MEDIUM	KOH and anti foam
OPERATING PRESSURE	
VESSEL	3 bar abs
HEATING JACKET	2 bar abs
TEST PRESSURE	
VESSEL	4 bar abs
HEATING JACKET	3 bar abs
MATERIAL	
VESSEL	AISI 304
HEATING JACKET	Carbon steel
FLOWSHEET	4x/9513201
	3x/9513228

ITEM NO.	100 200
	02 03
SURFACE TREATMENT	
INTERNAL	glasbead glasbead
EXTERNAL	glasbead glasbead
INSULATION	
MATERIAL	Wine-fl.
MIN. TEMPERATURE	-20°C
MAX. TEMPERATURE	140°C
OPERATING TEMPERATURE	
VESSEL	20°C
HEATING JACKET	140°C
OPERATING WEIGHT	app. 3600 kg
VESSEL WEIGHT, EMPTY	app. 1600 kg

ITEM	SPECIFICATION	Nº PIECES	SIZE	REMARKS
A	PRODUCT INLET	1	NW 32	
B	AIR INLET	1	nW 3/8"	
C	CLEANING NOZZLE	--	--	
D	AIR OUTLET	--	--	
E	SIGHT GLASS WITH LAMP	--	--	
F	OVERFLOW	--	--	
G	SIGHT GLASS	--	--	
H	HW INLET	1	NW 40	
I	HW OUTLET	1	NW 40	
K	INOCULATION-TRANSFER	--	--	
L	STAND GLASS	--	--	
M	MANHOLE	--	--	
N	HANDHOLE	1	NW 150	
O	BOTTOM - OUTLET	1	NW 10	
P	PI - MANOMETER	--	--	
Q	SAMPLE VALVE	--	--	
R	CHEMICALS	--	--	
S	STIRRER FLANGE	1	NW 200	
T	LEVEL TRANSMITTER	--	--	
U	TI - THERMOMETER	--	--	
V	TEMP. TRANSMITTER	--	--	
W	pH TRANSMITTER	--	--	
X	AP - PROBE	--	--	
Y	AP - INLET	--	--	
Z	CIRCULATION	--	--	

A		D	
B		E	
C		F	

GROUP NO.	SCALE	DRWD BY	11.7.80
		CHECKED BY	11.7.80
		PROJ ENG.	
		PROC ENG.	

PEC Process Engineering Company
CH 8708 Männedorf, Switzerland

9513200

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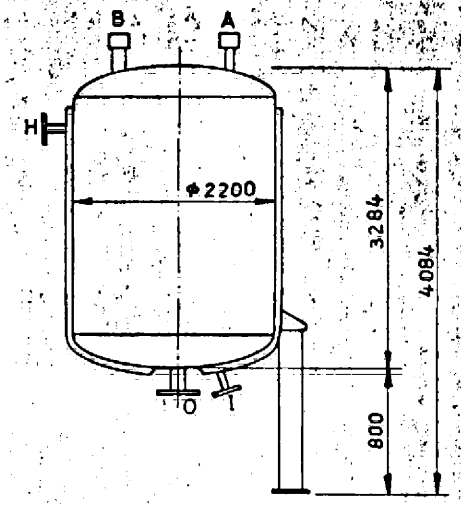

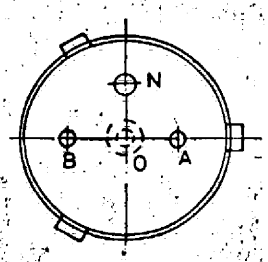

TECHNICAL DATA

CONSTRUCTION NO.	---	ITEM NO. 1 pcs.	03-T-02
TOTAL VOLUME	10 m³		
OPERATING VOLUME	---	SURFACE TREATMENT	
HEATING JACKET	---	INTERNAL	---
MEDIUM	H_3PO_4	EXTERNAL	---
OPERATING PRESSURE		INSULATION	
VESSEL	3 bar abs.	MATERIAL	Mineral wool & PU Foam
HEATING JACKET	2 bar abs.	MIN. TEMPERATURE	20°C c°
TEST PRESSURE		MAX. TEMPERATURE	140°C c°
VESSEL	4 bar abs.		
HEATING JACKET	3 bar abs.	OPERATING TEMPERATURE	
MATERIAL		VESSEL	30°C c°
VESSEL	Carbon steel	HEATING JACKET	140°C c°
HEATING JACKET	Carbon steel		
FLOWSHEET	4x/9513203 2x/9513238	OPERATING WEIGHT	app. 12'500 Kg
		VESSEL WEIGHT, EMPTY	app. 2'500 Kg

ITEM:	SPECIFICATION	Nº PIECES	SIZE	REMARKS
A	PRODUCT INLET	1	NW 25	
B	AIR INLET	1	NW 3/8"	
C	CLEANING NOZZLE	---	---	
D	AIR OUTLET	---	---	
E	SIGHT GLASS WITH LAMP	---	---	
F	OVERFLOW	---	---	
G	SIGHT GLASS	---	---	
H	HW INLET	1	NW 80	
I	HW OUTLET	1	NW 80	
K	INOCULATION - TRANSFER	---	---	
L	STAND GLASS	---	---	
M	MANHOLE	---	---	
N	HANDHOLE	1	NW 150	
O	BOTTOM - OUTLET	1	NW 15	
P	PI - MANOMETER	---	---	
Q	SAMPLE VALVE	---	---	
R	CHEMICALS	---	---	
S	STIRRER FLANGE	---	---	
T	LEVEL TRANSMITTER	---	---	
U	TI - THERMOMETER	---	---	
V	TEMP. TRANSMITTER	---	---	
W	pH TRANSMITTER	---	---	
X	AP - PROBE	---	---	
Y	AF - INLET	---	---	
Z	CIRCULATION	---	---	

PHILIP MORRIS WA 19 041

A		D			
B		E			
C		F			

H_3PO_4 Tank 10 m³

GROUP NO.	SCALE			
03	NTS	DRWD BY	KN	11.7.80
		CHECKED BY	WE	11.7.80
		PROJ ENG		
		PROC ENG		

PEC Process Engineering Company
CH 8708 Männedorf Switzerland

3 | 9513281

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ARCHIVE LOCATION VARIANCE SHEET

THE NUMBER (RANGE) 1003384192 IS LOCATED:

( ) IN THE AUDIO CABINET _____

( ) IN THE VIDEO CABINET _____

( ) ON THE OVERSIZE SHELF _____

( ) IN THE MICROFORMS CABINET _____

( ) AT THE WAREHOUSE _____

( ) IN THE TRANSLATION/TRANSCRIPTION FILES

_____

(X) OTHER _____

OVERSIZE DOCUMENT IN COLLECTION

1003384192

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04

1003384193

1003384193

Source: https://www.industrydocuments.ucsf.edu/docs/hhyp0000

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( ) IN THE MICROFORMS CABINET _____

( ) AT THE WAREHOUSE _____

( ) IN THE TRANSLATION/TRANSCRIPTION FILES

_____

(X) OTHER _____

OVERSIZE DOCUMENT IN COLLECTION

1003384194

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

FERMENTATION	GROUP NO. 04	OFFER NO.	WA: 19'041
PHILIP MORRIS SCHWEIZ		ORDER NO.	PAGE:

ITEM	PIECE	SPECIFICATION	kW	MAT.	SIZE / CAP.	REMARKS
TF-01	1	Main fermenter complett	220	1.4435	75 m^3	Fully equipped incl. control
TF-02	1	Main fermenter complett	220	1.4435	75 m^3	Fully equipped incl. control
TF-03	1	Main fermenter complett	220	1.4435	75 m^3	Fully equipped incl. control
TF-04	1	Main fermenter complett	220	1.4435	75 m^3	Stand by
T -01	1	Harvest tank	-	1.4301	5 m^3	For fermented broth
T -02	1	Buffer tank	-	1.4301	15 m^3	For fermented broth
T -03	1	Buffer tank	-	1.4301	15 m^3	Stand by
P -01	1	Volumetric pump	4,2	1.4301	28 m^3/h	
P -02	1	Volumetric pump	4,2	1.4301	28 m^3/h	
P -03	1	Centrifugal pump	2,2	1.4301	28 m^3/h	
P -04	1	Centrifugal pump	2,2	1.4301	28 m^3/h	
FA-01	1	Air filter	-	1.4301	3955 Nm^3/h	Sterile
FA-02	1	Air filter	-	1.4301	3955 Nm^3/h	Sterile
FA-03	1	Air filter	-	1.4301	3955 Nm^3/h	Sterile
FA-04	1	Air filter	-	1.4301	3955 Nm^3/h	Sterile
FA-05	1	Air filter	-	1.4301	3955 Nm^3/h	Sterile
FA-06	1	Air filter	-	1.4301	3955 Nm^3/h	Sterile
FA-07	1	Air filter	-	1.4301	3955 Nm^3/h	Sterile
FA-08	1	Air filter	-	1.4301	3955 Nm^3/h	Sterile
FA-09	1	Air filter	-	1.4301	15 Nm^3/h	Sterile
FA-10	1	Air filter	-	1.4301	21,6 Nm^3/h	Sterile
FA-11	1	Air filter	-	1.4301	21,6 Nm^3/h	Sterile

p.e.c.	DATE: 11.7.80	CHECKED BY: W. Frei	NO. 4-951 3229 / 1

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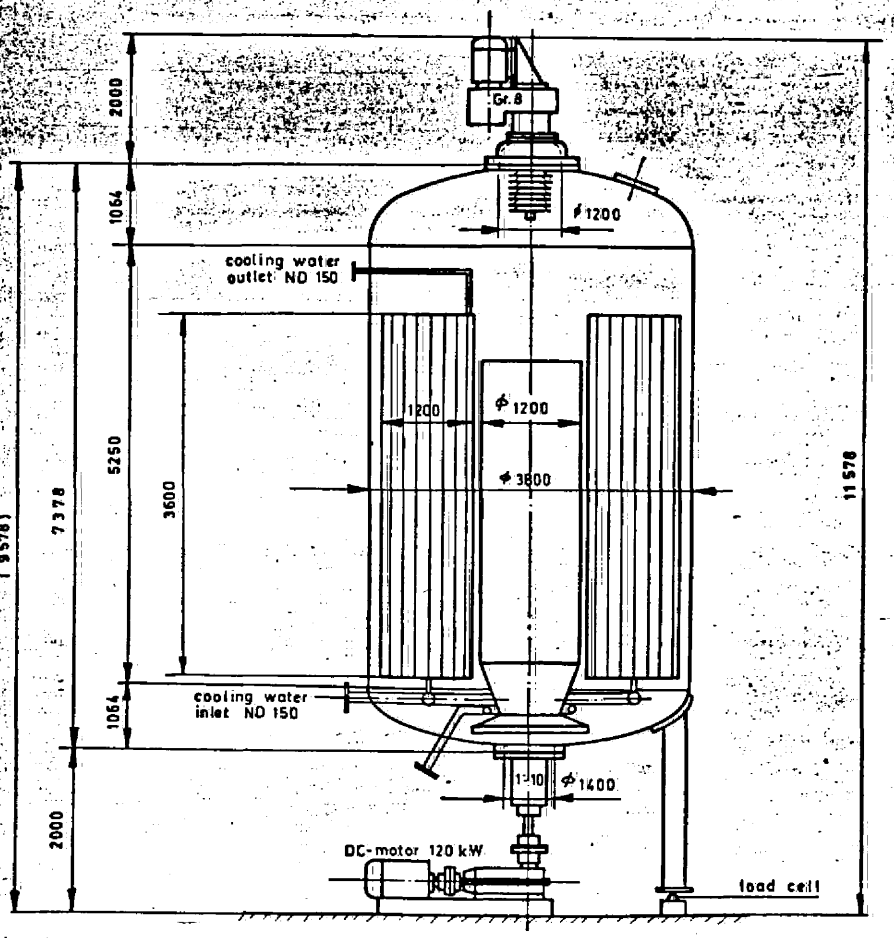

Änderungen: a ..... d .....
b ..... e .....
c ..... f .....

Ersetzt durch:
Ersatz für:

FERMENTER 75 m³

Maßstab			
1/10	Gezeichnet	14.7.80	Kirchhoff
	Geprüft		
	Normgeprüft		
	Gesehen		

PEC Process Engineering Company,
CH-8708 Männedorf, Switzerland

4

9513267

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MECHANICAL FOAM BREAKER "FUNDAFOM" ® Size 8

(see sketch FO 1527a)

The addition of chemical anti-foam solution has many disadvantages, e.g. prolongation of the fermentation time, impurity and difficulty during preparation of the Ninomass after fermentation. The mechanical foam breaker "Fundafom" allows separation of the foam into a liquid and gas phase also when working with high air capacities. The Fundafom is protected by patents of our firm.

Construction

The Fundafom consists of a rotating hollow shaft on the bottom part of which, i.e. in the reaction vessel, conical discs are mounted. This portion of the shaft is perforated with a series of holes. Radial baffles are fitted to these discs to give a good breaking effect.

The drive shaft is sealed by means of a double mechanical seal which operates in exactly the same manner as the fermentor seal and is also connected to the condensate vessel of the fermentor seal. The Fundafom is driven separately by an electric motor and power is transmitted from the motor to the main shaft by means of tight belts.

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10033841 97

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Function

The Fundafom is mounted in the central hole of the fermentor cover. The gas and liquid mixture from the fermentor vessel flows into the separator cones and, due to the high velocity of the discs, the liquid is thrown back to the fermentor vessel. At the same time the lighter gas phase passes through the holes in the hollow shaft to the outside.

Size (type)	3
Speed of the discs	1000 rpm
Diameter of the discs	330 mm
Exhaust tube	80 mm
Max. gas capacity	300 m^3/h

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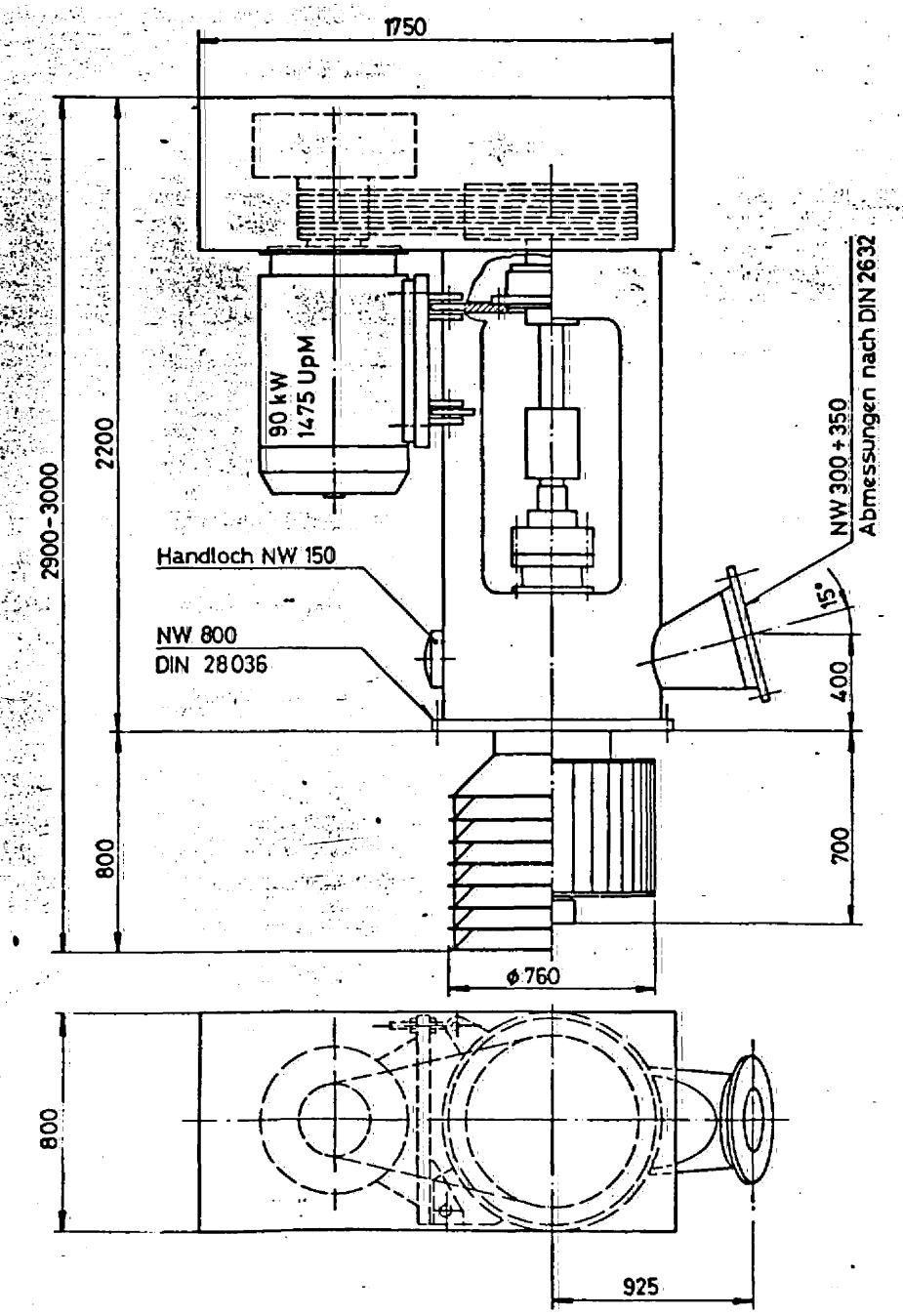
Source: https://www.industrydocuments.ucsf.edu/docs/fjty0000

Fundafom/Turbofom Gr.8

Anordnung: mit Fussmotor

Gew. tot.: ca. 2500 kg



Chemap AG
CH-8708 Männedorf
Switzerland
Telefon 01 922 11 01

gez	22.11.76 Bm	4	FO 1942
gepr	Thi.		
ges.			

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Source: https://www.industrydocuments.ucsf.edu/docs/fhyl0000

Temperature control

The temperature in the fermentor is measured by means of an electric temperature probe. The probe is located on the lower part of the cylindrical vessel. The output of the probe is fed to a controller with proportional-integral function and at the same time connected to the 6-point recorder.

The controller output operates the cooling water valve. A manual override is provided to allow independent adjustment.

Temperature control is carried out in a closed system, circulating water through the baffles of the fermentor. If a deviation to the set-point of the temperature is registered, the necessary control valve will immediately be operated automatically, to feed cooling water.

Sterilization

Sterilization is done manually.

The temperature control consists of:

- temperature probe PT 100
- connection to the 6-point recorder

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

pH CONTROL

The pH control corrects automatically on the acid and base side.

The pH is measured by means of a steam-sterilizable combination electrode. The probe is located on the lower part of the cylindrical vessel. The output of the probe is amplified and recorded on the 6-point recorder. At the same time the signal is fed to the controller which has an injection time and a dead time which can be regulated. The set-point of the pH value is automatically controlled and remains constant. By changing the set-point on the controller, the pH can be varied.

The pH control consists of:

- 1 pH electrode
- 1 amplifier
- 1 connection to the 6-point recorder
- 1 impulse regulator
- 2 pneumatic valves

Dosing of acid and base by means of 2 pneumatic valves.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Chemical antifoam device

A foam-probe, Teflon coated, is located in the cover of the fermenter. The probe is adjustable in height. As soon as the tip of the probe contacts foam a signal is amplified and a timer system regulates the metering pump for the addition of antifoam liquid.

The chemical antifoam device consists of :

- foam probe
- amplifier
- electronic impulsator

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

pO_2 MEASUREMENT AND CONTROL

With the new system, it is possible to measure the dissolved oxygen in the fermentor. The pO_2 probe can be sterilized in the autoclave or in place in the fermentor. The anode consists of a platinum wire and the cathode is made of silver/silver chloride. A KCl - Methyl-Cellulose-Gel is used as the electrolyte. The membrane is made of a stainless steel screen, coated with a silastic component. The membrane can be used for several sterilizations without changing the measuring point. After 10 sterilization cycles, the membrane may have to be changed by removing the cap. The signal from the probe is amplified and fed to the 6-point recorder and to the electro-pneumatic convertar. The location of the pO_2 electrode is in the lower part of the cylindrical vessel.

The output signal is fed to the controller which regulates the control valves of the O_2 or N_2 feed into the fermentor. These control valves are located directly on the rotameters and regulate the O_2 or N_2 capacity. An indication is given on the rotameters. The airfeed into the fermentor is fixed manually. The instrument shows the effective pO_2 partial pressure in the fermentation broth and is also registered on the 6-point recorder.

The pO_2 control system consists of:

- 1 pO_2 electrode with membrane
- 1 amplifier
- 1 connection to the 6-point recorder
- 2 electro-pneumatic converters
- 2 pneumatic controllers
- 2 control valves

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

CONTINUOUS CULTURE

The continuous culture is carried out by means of an electric load cell, weighing the whole fermentor. This device consists of a load cell, amplifier, controller, indicator and timer.

A metering pump continuously injects the substrate into the fermentor. As soon as the weight of the fermentor exceeds the pre-set value on the controller, the harvesting valve opens and the broth leaves the fermentor.

A timer is necessary in order to set the opening time of the harvesting valve, and also to control the volume of the broth leaving the fermentor.

This system consists of:

- load cell
- amplifier
- controller
- indicator with set point
- pneumatic relay

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

ALFA-LAVAL

Pompe centrifuge en acier inoxydable, type ALC-1

04-PC-03
04-PC-04

Application

La pompe centrifuge du type ALC-1 est recommandée pour l'utilisation dans l'industrie alimentaire et les industries chimiques, où de l'acier inoxydable anti-acide résiste aux liquides existants.

La pompe est munie d'une roue qui, avec le corps de forme hélicoïdale, assure un pompage efficace et un traitement ménageant du liquide.

Construction standard

Matières

Toutes le pièces entrant en contact avec du liquide, c'est-à-dire le corps de pompe, la roue de pompe avec boulon et plaque arrière sont en acier anti-acide, AISI 316.

La frette est en acier inoxydable AISI 304. La bride intermédiaire sur le moteur est en fonte.

Joints en caoutchouc EP.

Garniture d'arbre

Joint plan équilibré, asservi par ressort, avec une bague d'étanchéité stationnaire fixe en matière céramique et un manchon d'étanchéité rotitif en charbon. Un système d'étanchéité équilibré signifie que la pression de pompage n'agit pas sur le joint.

Raccordements

Les raccords sont dotés de douilles de serrage ISO. Admission: 63,5 mm. Sortie: 51 mm.

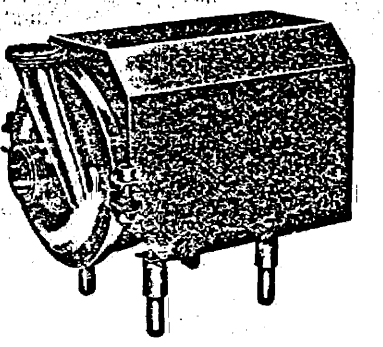
Moteur

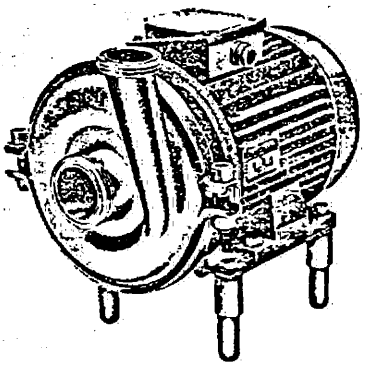
Moteur standard selon les normes IEC, 3000 tr/mn., courant alternatif triphasé 220/380 jusqu'à 4 kW, 380/660 V (380 △) au-dessus de 4 kW. Les deux alternatives peuvent être utilisées la marche sur du 380 V. 220/380 V pour démarrage direct et 380/660 V pour démarrage direct ou étoile-triangle.

	Roue de pompe Ø mm	Moteur kW
ALC-1	120	1,5—4

Equipement optionnel

a) Pièces de raccordement en type autre que des douilles de serrage ISO
b) Ecrous, nipples, manchons et joints pour raccords
c) Roue de pompe de diamètre réduit
d) Vanne de réglage (SMO-R) pour la conduite de refoulement
e) Double joint d'arbre pour arrosage avec agent de blocage
f) Tension et fréquence autres que standard
g) Pieds inoxydables réglables, AISI 304
h) Capot de moteur et pieds en acier inoxydable, AISI 304
i) Joints en caoutchouc nitrile résistant aux huiles
k) Joints en viton pour liquides aggressives.





Débits

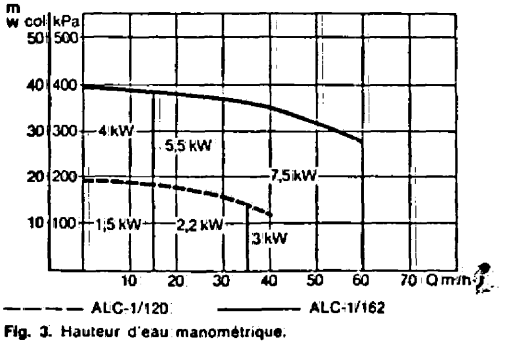


Fig. 3. Hauteur d'eau manométrique.

No. PD 61039F

1003384205

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Pompe centrifuge en acier inoxydable, type ALC-1

Colisage

Puissance du moteur	Poids net
1.5 kW	26 kg
2.2 kW	28 kg
3.0 kW	34 kg
4.0 kW	41 kg
5.5 kW	55 kg
7.5 kW	55 kg

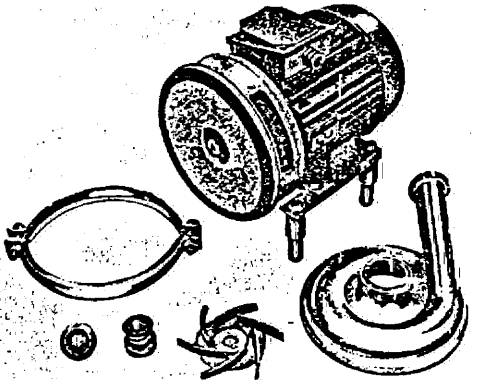
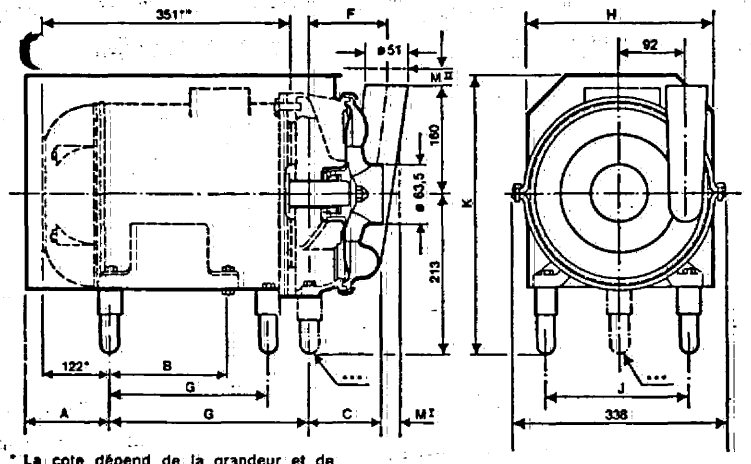


Fig. 4. Pompe ALC-1 démontée pour inspection.

Dimensions

Toutes les cotes en mm.



* La cote dépend de la grandeur et de la fabrication du moteur.
** Longueur max. de moteur pour pompe avec manteau.
*** Seulement un pied avant pour les moteurs de 5,5—7,5 kW.

Dimensions en mm	Moteur					
	1,5 kW	2,2 kW	3 kW	4 kW	5,5 kW	7,5 kW
A	106	106	111	111	154	154
B	100	125	140	140	140	140
C	95	95	119	119	81	81
F	119,5	119,5	143,5	143,5	105,5	105,5
G	150	175	183	190	267	267
H	248	248	255	255	319	319
J	140	140	160	190	216	216
K	347	347	372	372	390	390

Raccords					
DI 63,5 DII 51	ISO pince de serrage	ISO nipple	SMS nipple	DIN nipple	BS nipple
MI	28	21,5	24	25	24
MII	21,5	21,5	20	22	24

ALFA-LAVAL
FLOW EQUIPMENT

No. PD 61039F
Reg. 37235
1991
Printed in Sweden β

1003384206

Source: https://www.industrydocuments.ucsf.edu/docs/hhyj0000

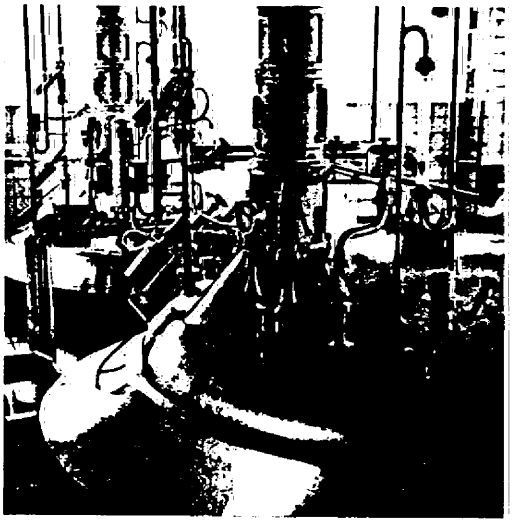
10033842O7

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

The real price of contaminated compressed air is not the price you pay for it.

In the food, pharmaceutical, brewery and other process industries sterile compressed air is vital to maintaining both quality and delivery schedules. Contamination in the compressed air supply is very expensive. Loss of production, loss of quality, rejects - raw material loss, direct labour, missed delivery dates are just some of the consequences. The cause is easily explained.

Unfiltered compressed air will contain micro-organisms such as, bacteria, bacteriophages and viruses. They are minutely small, often only 0.01 to 2 microns in size. If they are not 100% removed, the effect is large, so large you can pay dearly for it.



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Source: https://www.industrydocuments.ucsf.edu/docs/hhyj0000

ultrafilter Provides 100% Sterile Compressed Air with Added Benefits.

ultrafilter is the cost effective solution to the problem. Guaranteed 100% sterile air with continuous reliability in operation. Longer filter cartridge life means greater economy, and that is true not only of expensive compressed air systems using oil free compressors, but also for sterile compressed air from oil lubricated compressors.

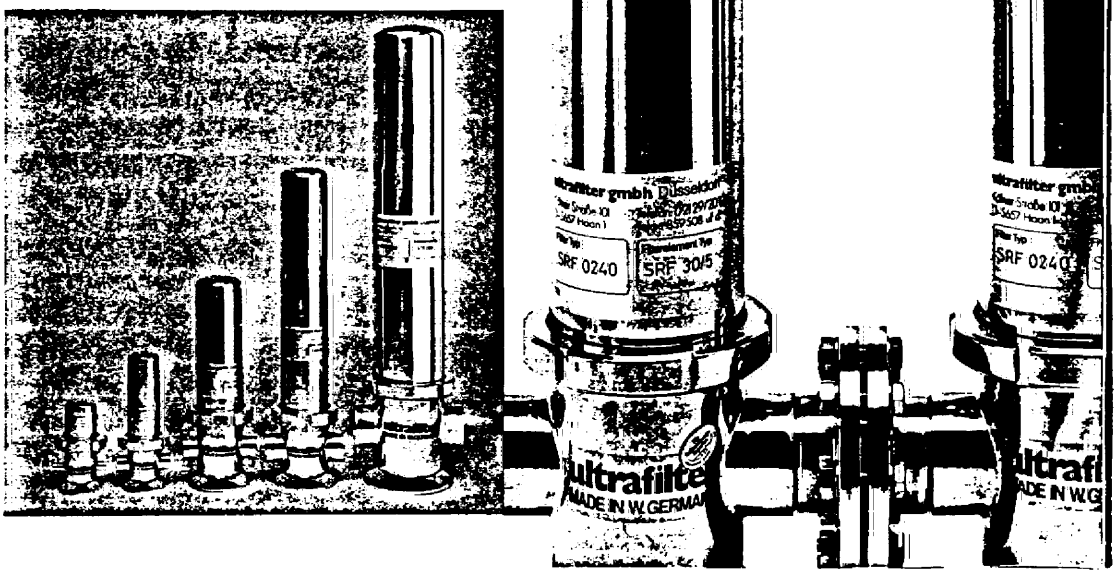
ultrafilter performance is due to the specially developed, three dimensionally layered, ultrafilter filter media 'ultrair®', a binder free microfibre filter media. As all the fibres are made from an inorganic material, the media is naturally hydrophobic, therefore changes in the material due to the presence of water are eliminated.

Ultrair® filter media has a unique two-stage filtration effect and a voids volume of over 90% giving a low pressure drop which guarantees longer working life and lower operating costs. With an efficiency of 99.99998% everything larger than 0.01 micron is filtered out - that is the absolute efficiency attainable today and ensures the air is 100% sterile.

Together with ultrafilter oil removal filters and ultrafilter dryers sterile compressed air from oil lubricated compressors is no longer a problem.

All ultrafilter equipment is designed around a modular concept ensuring the right filter and dryer combinations are available right across the range. ultrafilter customers benefit from the company's 'no compromise' policy ensuring that only the highest quality materials and production techniques are used to give maximum operating reliability. Every component used and all sterile filter elements are tried and tested before despatch.

ultrafilter air sterilisation filters will provide a continuous and reliable supply of absolutely sterile compressed air for your process requirements ensuring better product quality and production reliability. The savings you gain from using ultrafilter can often mean your capital outlay can be recouped in a year - there's only one standard in sterility that's 100%. Get the 100% solution, buy sterile compressed air filters from ultrafilter.



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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

ultrafilter purific
On balance the co

The ultrafilter principle and its advantages

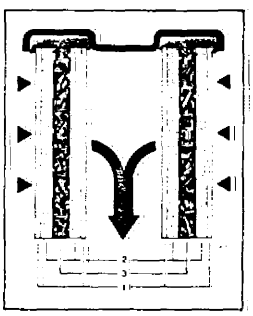
In order to provide a continuous and reliable supply of sterile compressed air the following three important points must be considered:

1. All viable micro-organisms such as bacteria, bacteriophages and virus must be filtered out - 100%.
2. The filter media must be designed in such a way that it will not allow bacteria to grow on it or through it. It must not degrade during repeated steam sterilisation cycles, often at temperatures of up to 200° C.
3. The filter element must also be able to withstand repeated shock loads imposed by rapid opening valves, giving an almost instantaneous no-flow/maximum-flow situation.

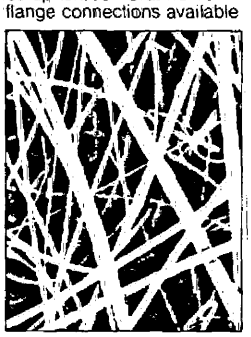
ultrafilter sterile filter elements combine all three considerations. In operation, the previously filtered air flows outside to in through the filter element. Micro-organisms and particulate matter down to 1 micron are trapped on the prefilter stage, while all remaining contamination is retained by the three dimensionally layered ultrair® micro-fibre media. The filter media is completely inert and free from all resin binders having excellent chemical resistance. Bacteria cannot grow on it or through it. Stainless steel support sleeves intimately support the sandwich construction allowing air or steam to flow in either direction.

The ultrafilter construction

1. The ultrafilter housing
   - designed for optimum flow
   - housing supplied in either stainless steel or galvanised mild steel with all internal contact parts and outlet surfaces in stainless steel
   - stainless steel housing with quick release and audible warning signal
   - easy to handle and maintain
   - a patented safety mounting ensures perfect element location top and bottom
   - built and tested for temperatures up to 200° C at nd 16
   - DIN or BS standard thread or flange connections available



1 Stainless steel support sleeves
2 First stage prefilter
3 Second stage three dimensional ultrair® filter media

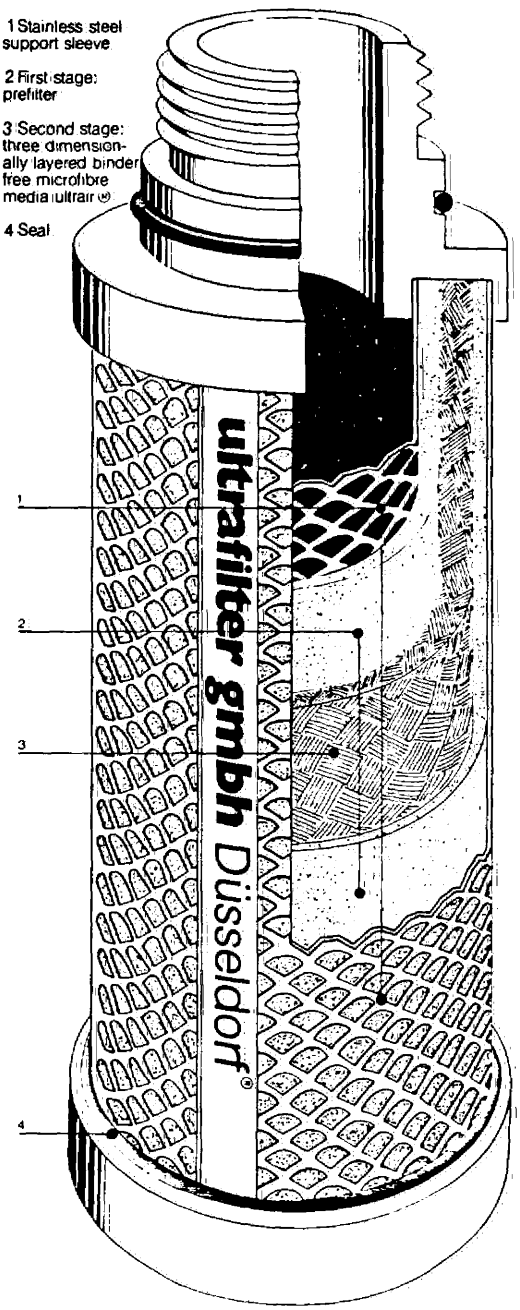


Three dimensionally layered ultrair® micro-fibre filter media

2. The ultrafilter filter element
   - two stainless steel support sleeves hold prefilter and ultrair® micro-fibre filter media immovable
   - non-fraying filter media cannot migrate and complies with FDA standards*
   - suitable for in-situ standard or reverse-flow steam sterilisation
   - end caps are bonded to support sleeves by high temperature resistant silicon rubber
   - reliable sealing with a single durable silicon rubber O-ring

ultrafilter reliability in operation

All ultrafilter filtration equipment is examined several times during assembly and every ultrafilter air sterilisation element is rigorously tested before it leaves the factory. Since the filter media is inorganic and binder free it will provide no nutrient whatsoever to support micro-organisms.



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1003384210

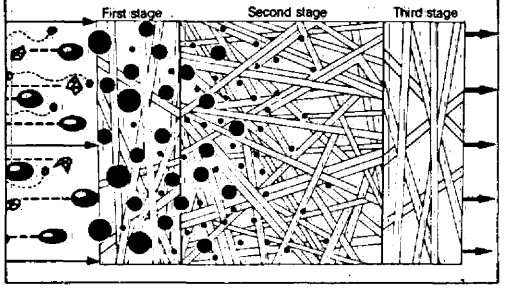
Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

ation technology.
st-effective answer.

Further the media cannot rot or decompose or be destroyed by any other means. The filter elements will withstand repeated steam sterilisation with high pressure steam up to 200° C. The filtration efficiency is 100% even between 1% to 200% of rated flow. The unique ultrair® filter media has a sandwich construction giving a two-stage filtration effect and ensuring a significant extension to working life. Guaranteed double reliability.

*FDA = Fachnormenausschuss Druckgas-Anlagen
(DIN subcommittee for compressed gas equipment)

By utilising direct interception, inertial impaction and diffusion, liquid and solid particles down to 0.01 micron are retained by the filter.

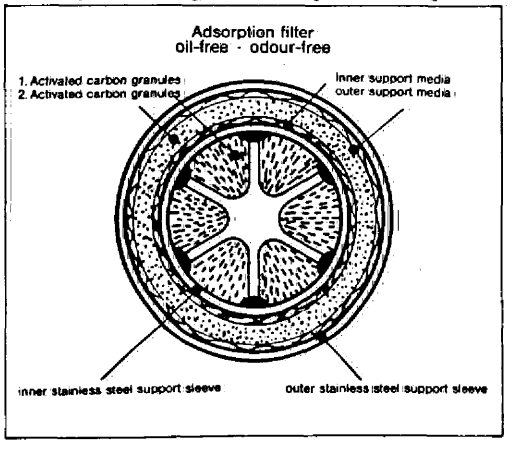


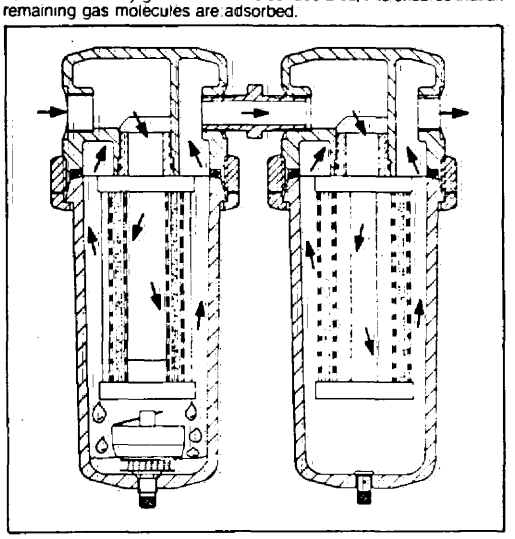
The ultrafilter promise - dry, clean, oil-free air

By using the ultrafilter combination MF/SMF + AK you will achieve breathing quality compressed air. The air will be free from all oil, water, dirt and, more importantly for breathing air applications, all hydrocarbon gases and organic odours. The quality will exceed the stringent requirements of DIN 3188 for ventilating air.

To achieve this very high standard of air cleanliness, the dirty oil laden compressed air first passes through the Type MF Microfilter. Here the large particulates and free liquid oil and water is removed. The air then passes through a Type SMF Submicrofilter where the remaining fine particles are removed, and where by coalescence the finely divided oil and water aerosols are formed into bulk liquid and seperated from the air. The clean dry air then passes through the two-stage Type AK active carbon filter.

The Type AK ultrafilter element represents a major breakthrough in gas adsorption techniques. It has two stages of adsorption. The first stage has a star-shaped diffuser which is permeable and filled with actived carbon. This has the effect of slowing down the air and distributing it evenly throughout the bed of granules allowing these to adsorb the hydrocarbon gas molecules. The air then passes directly into the second stage which has very finely ground activated carbon supported within a high efficiency filter media. The smaller granules have considerably greater available surface area; this ensures that all remaining gas molecules are adsorbed.





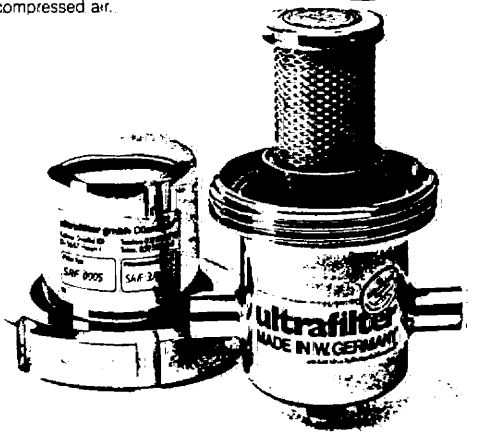
The ultrafilter guarantee

As an expression of confidence in our air sterilisation products and your assurance that your capital investment will pay off, we guarantee you will achieve 100% sterility. Our guarantee gives you peace of mind that you can rely on a constant supply of sterile air. Further, as all ultrafilter products are extremely reliable they require the minimum of maintenance. ultrafilter gives a 5-year materials guarantee on filter housings, and a minimum of 100 hours or 100 steam sterilisation cycles in operation for the filter elements.

Look at the benefits of using ultrafilter
* total reliability in operation
* double working life
* lower capital and operating costs

The ultrafilter engineers are continually striving to improve on perfect to ensure you will always have available the very best filtration products to ensure you have clean, trouble-free, economical compressed air.

ultrafilter Garantie



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Source: https://www.industrydocuments.ucsf.edu/docs/hhy00000

ultrafilter air sterilisation and steam filters.

ultrafilter sterilisation filters for 100% sterile compressed air or gases

ultrafilter steam filters, 100% efficient at 30 micron pore size

Type SRF — air sterilisation reverse flow D — Steam filter	Capacity at 7 bar line pressure Nm³/h Minimum	Nm³/h Maximum	Connections R = radius	Dimensions in mm length A	width B	height to connection C	length of bowl D	Weight in kg
0005	30	40	R ¼" R ⅜"	226	Ø110	40	140	2
0007	45	60	R ⅜"	226	Ø110	40	140	2,5
0010	60	80	R ½"	226	Ø120	46	140	3
0015	90	120	R ¾"	238	Ø120	54	140	3,5
0020	120	160	R 1"	268	Ø140	54	170	4
0030	160	200	R 1¼"	312	Ø160	65	180	5,5
0060	320	400	R 1½"	440	Ø160	65	310	6,5
0090	480	600	R 2"	552	Ø170	65	420	7,5
0120	640	800	R 2½"	732	Ø200	94	560	21
0160	960	1200	R 3"	986	Ø200	94	800	23
0240	1440	1800	R 3"	998	Ø240	110	800	25

Type 0005 to 0240 housings are stainless steel 1.4301. Adaptor for milk type screw connections to DIN 11 851 and screw-in flanges available at extra cost.

0320	1920	2400	NW 100	900	410	750	580	80
0480	2880	3600	NW 100	1170	410	1020	850	90
0640	3840	4800	NW 150	1270	480	1090	875	130
0960	5760	7200	NW 150	1320	540	1100	875	150
1280	7680	9600	NW 200	1410	660	1170	875	236
1600	9600	12000	NW 200	1430	660	1170	875	240
1920	11520	14400	NW 250	1520	800	1230	875	376
2560	15360	19200	NW 250	1540	800	1230	875	380
3200	19200	24000	NW 300	1640	930	1300	875	530

Type 0320 to 3200 housings are galvanised steel. All internal parts and outlet surfaces are in stainless steel 1.4301. All stainless steel housings are available at extra cost.

Type	Pressure differential in bar in clean condition
SRF	0.07
* capacity for steam filters in kg/h at 120%C.	

Prefilter
The use of prefilters is recommended where heavy contamination of oil, water and dirt is anticipated. Steam filters should be installed to clean the steam used during the sterilisation cycle.

Dryers
For all sterile applications the air MUST be moisture free a dryer is recommended.

Steam sterilisation
ultrafilter air sterilisation filter elements can be steam sterilised in-situ with steam up to 200° C.

Maintenance
The filter elements should be changed when the differential pressure reaches 1 bar or earlier to suit your own preventive maintenance routines. The filter elements can be changed quickly and without difficulty.

Explanation
The capacities quoted in the table are for a line pressure of 7 bar. At other pressures the volumetric flow changes, the higher the pressure, the higher the permissable flow rate – see the table on the next page for details.

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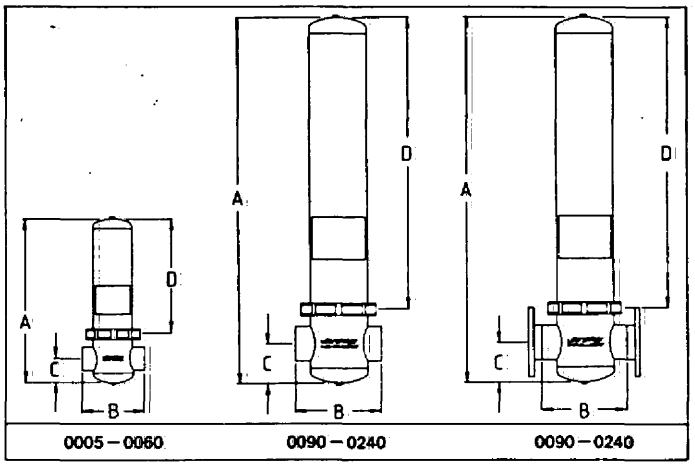
Source: https://www.industrydocuments.ucsf.edu/docs/hhy40000

Filter element		Number per stage
3/1	with threaded connection	1
3/1,5		1
4/1,5		1
4/2,5		1
5/2,5		1
5/3		1
10/3		1
15/3		1
20/3		1
30/3		1
30/5		1

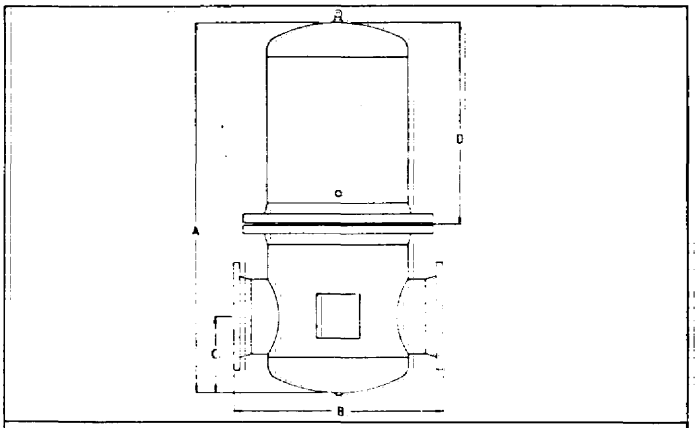
20/3-3	with flange connections	3
30/3-3		3
30/3-4		4
30/3-6		6
30/3-8		8
30/3-10		10
30/3-12		12
30/3-16		16
30/3-20		20

ultrafilter housings having only one filter element



0005 – 0060 | 0090 – 0240 | 0090 – 0240

ultrafilter housings having multi-element arrangements



0320 – 3200

Conversion table										
Working pressure	1	2	3	4	5	6	7	8	9	10 bar
Conversion factor x	0,25	0,36	0.5	0,6	0,75	0,90	1	1,1	1,2	1,4

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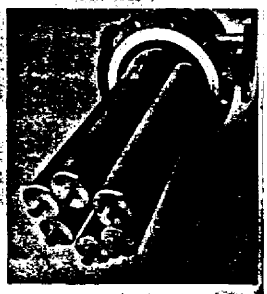
1003384213

Source: https://www.industrydocuments.ucsf.edu/docs/hhyf0000

ultrafilter. The Purification-Experts.

ultrafilter made in Germany

Behind every item of ultrafilter equipment lies the considerable experience gained through solving compressed air filtration and drying problems all over the world. Made to exacting specification and standards every item of ultrafilter equipment is the result of extensive research and development.



The ever increasing number of patents and the ultrafilter trade mark confirm our lead in in technology.

The ultrafilter Range

ultrafilter have a complete range of purification equipment, each designed with a specific purpose in mind - whether you need a simple prefilter or a complete sterile air system, the ultrafilter engineer can help you select the cost-effective answer. No other company has such a comprehensive range; prefilters, oil removing filters, odour adsorption, liquid filters, vacuum filters, ventilation and extraction filters. We also manufacture a complementary range of refrigeration and adsorption dryers. ultrafilter equipment may be bought, leased or hired.

The ultrafilter Service

The ultrafilter applications engineer will visit your factory or office to discuss your specific requirements and also to take account of local environmental conditions. The ultrafilter engineers will install and 'run-in' your plant before handing it over to your staff. Service does not end with selling the equipment to you, if required the ultrafilter service division will undertake the periodic inspection and prompt changes of the filter elements.

ultrafilter

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1003384215

ultrafilter air sterilisation and steam filters.

04-FA-09

ultrafilter sterilisation filters for 100% sterile compressed air or gases

ultrafilter steam filters, 100% efficient at 30 micron pore size

Type SRF D	– air sterilisation reverse flow – Steam filter	Capacity at 7 bar line pressure Nm³/h Minimum	Nm³/h Maximum	Connections R = radius	Dimensions in mm length A	width B	height to connection C	length of bowl D	Weight in kg
	0005	30	40	R ¼" R ⅜"	226	Ø110	40	140	2
	0007	45	60	R ⅜"	226	Ø110	40	140	2.5
	0010	60	80	R ½"	226	Ø120	46	140	3
	0015	90	120	R ¾"	238	Ø120	54	140	3.5
	0020	120	160	R 1"	268	Ø140	54	170	4
	0030	160	200	R 1¼"	312	Ø160	65	180	5.5
	0060	320	400	R 1½"	440	Ø160	65	310	6.5
	0090	480	600	R 2"	552	Ø170	65	420	7.5
	0120	640	800	R 2½"	732	Ø200	94	560	21
	0160	960	1200	R 3"	986	Ø200	94	800	23
	0240	1440	1800	R 3"	998	Ø240	110	800	25

*Type 0005 to 0240 housings are stainless steel 1.4301. Adaptor for milk type screw connections to DIN 11851 and screw-in flanges available at extra cost

0320	1920	2400	NW 100	900	410	750	580	80
0480	2880	3600	NW 100	1170	410	1020	850	90
0640	3840	4800	NW 150	1270	480	1090	875	130
0960	5760	7200	NW 150	1320	540	1100	875	150
1280	7680	9600	NW 200	1410	660	1170	875	236
1600	9600	12000	NW 200	1430	660	1170	875	240
1920	11520	14400	NW 250	1520	800	1230	875	376
2560	15360	19200	NW 250	1540	800	1230	875	380
3200	19200	24000	NW 300	1640	930	1300	875	530

*Type 0320 to 3200 housings are galvanised steel. All internal parts and outlet surfaces are in stainless steel 1.4301. All stainless steel housings are available at extra cost

Type	Pressure differential in bar in clean condition
SRF	0.07
* capacity for steam filters in kg/h at 120°C.	

Prefilter
The use of prefilters is recommended where heavy contamination [illegible] should be installed to clean the steam used during the sterilisation cycle.

Dryers
For all sterile applications the air MUST be moisture free a dryer is recommended.

Steam sterilisation
ultrafilter air sterilisation filter elements can be steam sterilised in-situ with steam up to 200°C.

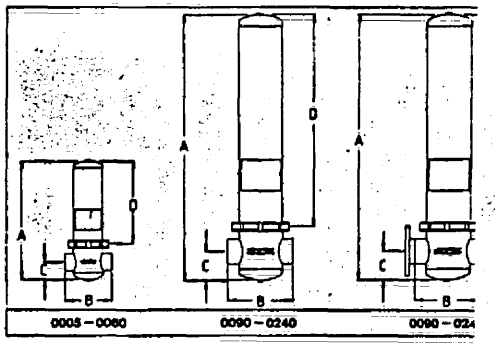
Maintenance
The filter elements should be changed when the differential pressure reaches 1 bar or earlier to suit your own preventive maintenance routines. The filter elements can be changed

Explanation
The capacities quoted in the table are for a line pressure of 7 bar. At other pressures the volumetric flow changes, the higher the pressure, the higher the permissable flow rate - see the table on the next page for details

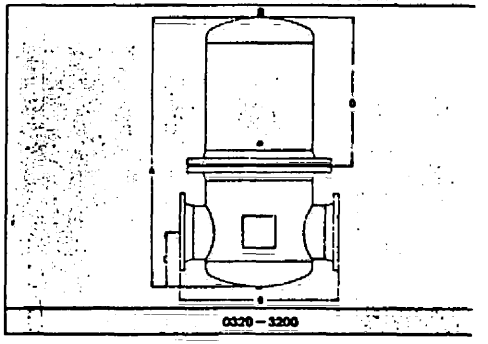
Filter element		Number per stage
3/1	with threaded connection	1
3/1,5 *		1
4/1,5		1
4/2,5		1
5/2,5		1
5/3		1
10/3		1
15/3		1
20/3		1
30/3		1
30/5		1

20/3-3	with flange connections	3
30/3-3		3
30/3-4		4
30/3-6		6
30/3-8		8
30/3-10		10
30/3-12		12
30/3-16		16
30/3-20		20

ultrafilter housings having only one filter element



ultrafilter housings having multi-element arrangements



Conversion table									
Working pressure	1	2	3	4	5	6	7	8	9
Conversion factor x	0,25	0,36	0,5	0,6	0,75	0,90	1	1,1	1,2

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

10033842 16

ultrafilter air sterilisation and steam filters.

04-FA-10
04-FA-11

ultrafilter sterilisation filters for 100% sterile compressed air or gases

ultrafilter steam filters, 100% efficient at 30 micron pore size

Type SRF D	– air sterilisation reverse flow – Steam filter	Capacity at 7 bar line pressure Nm³/h Minimum	Nm³/h Maximum	Connections R = radius	Dimensions in mm length A	width B	height to connection C	length of bowl D	Weight in kg
	0005	30	40	R ¼" R ⅜"	226	Ø110	40	140	2
	0007	45	60	R ⅜"	226	Ø110	40	140	2,5
	0010	60	80	R ½"	226	Ø120	46	140	3
	0015	90	120	R ¾"	238	Ø120	54	140	3,5
	0020	120	160	R 1"	268	Ø140	54	170	4
	0030	160	200	R 1¼"	312	Ø160	65	180	5,5
	0060	320	400	R 1½"	440	Ø160	65	310	6,5
	0090	480	600	R 2"	552	Ø170	65	420	7,5
	0120	640	800	R 2½"	732	Ø200	94	560	21
	0160	960	1200	R 3"	986	Ø200	94	800	23
	0240	1440	1800	R 3"	998	Ø240	110	800	25

Type 0005 to 0240 housings are stainless steel 1.4301. Adaptor for milk type screw connections to DIN 11 851 and screw-in flanges available at extra cost

0320	1920	2400	NW 100	900	410	750	580	80
0480	2880	3600	NW 100	1170	410	1020	850	90
0640	3840	4800	NW 150	1270	480	1090	875	130
0960	5760	7200	NW 150	1320	540	1100	875	150
1280	7680	9600	NW 200	1410	660	1170	875	236
1600	9600	12000	NW 200	1430	660	1170	875	240
1920	11520	14400	NW 250	1520	800	1230	875	376
2560	15360	19200	NW 250	1540	800	1230	875	380
3200	19200	24000	NW 300	1640	930	1300	875	530

Type 0320 to 3200 housings are galvanised steel. All internal parts and outlet surfaces are in stainless steel 1.4301. All stainless steel housings are available at extra cost.

Type	Pressure differential in bar in clean condition
SRF	0.07
* capacity for steam filters in kg/h at 120°C.	

Prefilter
The use of prefilters is recommended where heavy contamination [illegible] should be installed to clean the steam used during the sterilisation cycle

Dryers
For all sterile applications the air MUST be moisture free a dryer is recommended.

Steam sterilisation
ultrafilter air sterilisation filter elements can be steam sterilised in-situ with steam up to 200° C.

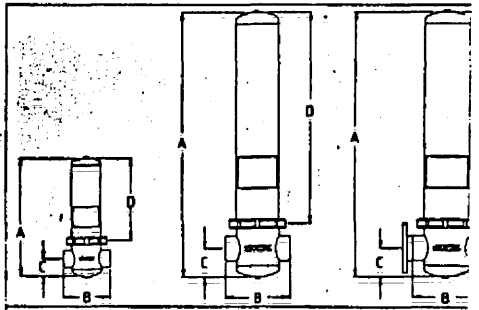
Maintenance
The filter elements should be changed when the differential pressure reaches 1 bar or earlier to suit your own preventive maintenance routines. The filter elements can be changed

Explanation
The capacities quoted in the table are for a line pressure of 7 bar. At other pressures the volumetric flow changes the higher the pressure, the higher the permissable flow rate – see the table on the next page for details

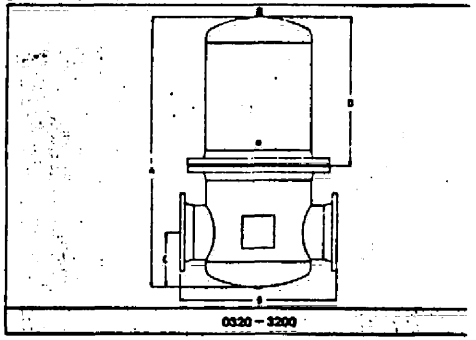
Filter element		Number per stage
3/1	with threaded connection	1
3/1,5 *		1
4/1,5		1
4/2,5		1
5/2,5		1
5/3		1
10/3		1
15/3		1
20/3		1
30/3		1
30/5		1

20/3-3	with flange connections	3
30/3-3		3
30/3-4		4
30/3-6		6
30/3-8		8
30/3-10		10
30/3-12		12
30/3-16		16
30/3-20		20

ultrafilter housings having only one filter element



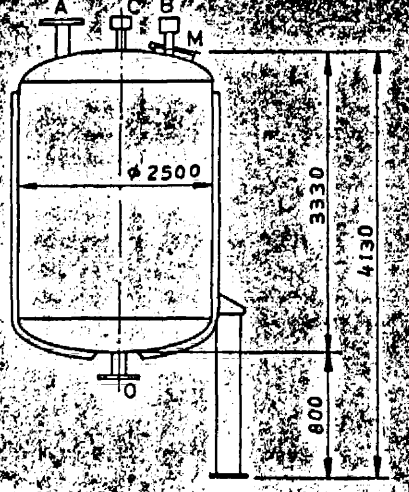
ultrafilter housings having multi-element arrangements

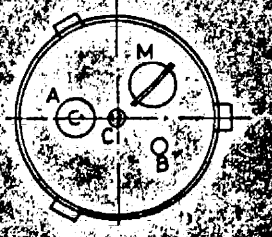


Conversion table

Working pressure	1	2	3	4	5	6	7	8	9
Conversion factor x	0,25	0,38	0,5	0,6	0,75	0,90	1	1,1	1,2

Source: https://www.industrydocuments.ucsf.edu/docs/nhyl0000





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Urheberschutz n. VSM 1031a

TECHNICAL DATA

CONSTRUCTION NO.	
TOTAL VOLUME	
OPERATING VOLUME	
HEATING JACKET	
MEDIUM	Fermenter broth
OPERATING PRESSURE	
VESSEL	3 bar ü
HEATING JACKET	
TEST PRESSURE	
VESSEL	3 bar ü
HEATING JACKET	
MATERIAL	
VESSEL	AISI 316
HEATING JACKET	Carbon steel
FLOWSHEET	4x/9513203
	2x/9513229

ITEM NO.	04-01-03
SURFACE TREATMENT	
INTERNAL	glassed
EXTERNAL	glassed
INSULATION	
MATERIAL	Mineral wool, PU foam
MIN. TEMPERATURE	5°C
MAX. TEMPERATURE	130°C
OPERATING TEMPERATURE	
VESSEL	30°C
HEATING JACKET	5°
OPERATING WEIGHT	approx. 15'500 kg
VESSEL WEIGHT, EMPTY	approx. 3'500 kg

ITEM:	SPECIFICATION	N° PIECES	SIZE	REMARKS
A	PRODUCT INLET	1	NW 80	
B	AIR INLET	1	NW 3/8"	
C	CLEANING NOZZLE	1	NW 25	
D	AIR OUTLET	--	--	
E	SIGHT GLASS WITH LAMP	--	--	
F	OVERFLOW	--	--	
G	SIGHT GLASS	--	--	
H	HW INLET	--	--	
I	HW OUTLET	--	--	
K	INOCULATION - TRANSFER	--	--	
L	STAND GLASS	--	--	
M	MANHOLE	1	NW 500	
N	HANDHOLE	--	--	
O	BOTTOM - OUTLET	1	NW 80	
P	PI - MANOMETER	--	--	
Q	SAMPLE VALVE	--	--	
R	CHEMICALS	--	--	
S	STIRRER FLANGE	--	--	
T	LEVEL TRANSMITTER	--	--	
U	TI - THERMOMETER	--	--	
V	TEMP. TRANSMITTER	--	--	
W	pH TRANSMITTER	--	--	
X	AF - PROBE	--	--	
Y	AF - INLET	--	--	
Z	CIRCULATION	--	--	

PROJECT	WA 10 041	A		D	
		B		E	
		C		F	

	GROUP NO.	SCALE	DRWD BY	KH	11.7.80
	04	NTS	CHECKED BY	MP	11.7.80
			PROJ. ENG.		
			PROC. ENG.		

B E Process Engineering Company
CH-8706 Meilen/Zürich Switzerland

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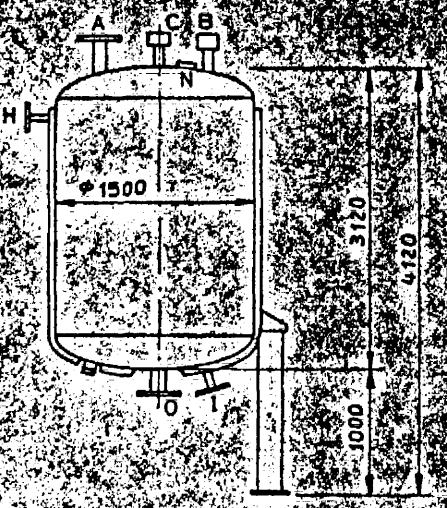

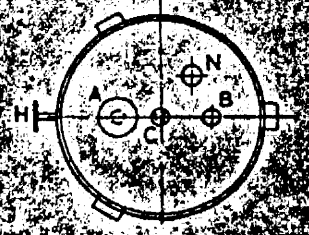

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TECHNICAL DATA

CONSTRUCTION NO.	[illegible]
TOTAL VOLUME	[illegible]
OPERATING VOLUME	[illegible]
HEATING JACKET	[illegible]
MEDIUM	fermenter broth
OPERATING PRESSURE	
VESSEL	[illegible] bar abs.
HEATING JACKET	2 bar abs.
TEST PRESSURE	
VESSEL	4 bar abs.
HEATING JACKET	3 bar abs.
MATERIAL	
VESSEL	AISI 304
HEATING JACKET	AISI 304
FLOWSHEET	4x/9513203
	2x/9513229

ITEM NO.	04-01
SURFACE TREATMENT	
INTERNAL	cleaned
EXTERNAL	cleaned
INSULATION	
MATERIAL	
MIN. TEMPERATURE	[illegible] °C
MAX. TEMPERATURE	[illegible] °C
OPERATING TEMPERATURE	
VESSEL	30 °C
HEATING JACKET	130 °C
OPERATING WEIGHT	APP. 5'640 Kg
VESSEL WEIGHT, EMPTY	APP. 1'640 Kg

ITEM:	SPECIFICATION	N° PIECES	SIZE	REMARKS
A	PRODUCT INLET	1	NW 80	
B	AIR INLET	1	NW 25	
C	CLEANING NOZZLE	1	NW 25	
D	AIR OUTLET	--	--	
E	SIGHT GLASS WITH LAMP	--	--	
F	OVERFLOW	--	--	
G	SIGHT GLASS	--	--	
H	HW INLET	1	NW 25	
I	HW OUTLET	1	NW 25	
K	INOCULATION - TRANSFER	--	--	
L	STAND GLASS	--	--	
M	MANHOLE	--	--	
N	MANHOLE	1	NW 150	
O	BOTTOM - OUTLET	1	NW 80	
P	PI - MANOMETER	--	--	
Q	SAMPLE VALVE	--	--	
R	CHEMICALS	--	--	
S	STIRRER FLANGE	--	--	
T	LEVEL TRANSMITTER	--	--	
U	TI - THERMOMETER	--	--	
V	TEMP. TRANSMITTER	--	--	
W	pH TRANSMITTER	--	--	
X	AF - PROBE	--	--	
Y	AF - INLET	--	--	
Z	CIRCULATION	--	--	

PHILIP MORRIS

WA 19 041

A		D			
B		E			
C		F			

GROUP NO. 304

SCALE NTS

DRWD BY	RN	11.7.80
CHECKED BY	WF	11.7.80
PROJ ENG		
PROC ENG		

PEC Process Engineering Company

A3

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyj0000

3.5 DESCRIPTION OF THE SEPARATION

05 - SEP - 01, 02, 03

The separation of Ninomass is achieved by means of three solids-discharging nozzle separators (one stand-by). The first separator discharges the Ninomass under pressure. The extract then flows to the evaporation plant and the Ninomass will be diluted for washing purposes with the same amount of water as before entering the separator. A pump pit, 05-T-01, is installed between the first and the second separator for wash-water and to prevent the pump starting empty (05-PC-01).

The Ninomass is fed to the second separator by means of the above-mentioned pump.

For safety reasons a stand-by separator is installed. The separation plant is wired together in such a way that, in the event of a break-down of one of the separators, the stand-by one can operate immediately. The broken-down separator can then be repaired with interruoting the process of the whole plant.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

05-SEP-01
05-SEP-02
05-SEP-03

ALFA-LAVAL
Solids-discharging nozzle separator model FEUX 512

Application

Separation of baker's and distiller's yeasts, fodder yeast and other micro-organisms from fermentation broths e.g. in the chemical and pharmaceutical industries.

Working principle

The solids and the liquid are separated in the high speed rotating separator bowl by means of centrifugal force.

The concentrated solids are discharged under pressure through the paring tube (see fig. 2) and the clarified liquid (effluent) leaves the separator through the paring disk pump.

The unique design features of the Alfa-Laval FEUX 512 separator, with pressurized discharges of both the concentrated solids and the clarified liquid, together with the internal location of the nozzles, offers the following advantages:

Small space requirements and fast mounting
Compact, closed pipe installations possible, as extra collecting tanks and pumps are not required.

Hygienic operation
Hygienic design as the pressurized discharges minimize air entrainment in the separated phases and thus also prevent foaming problems.

High efficiency
Well suited to process control, e.g. viscosity control of the discharged solids in order to obtain optimal separation performance.

Low operating costs
Easily adapted for continuously working plants with complete automation, which is especially important in multi centrifuge installations.

Reliable performance
Reliable and continuous operation as the location of the nozzles at a small bowl diameter permits big nozzle size minimizing the risk for nozzle blockage.

Time and labour savings
The separator is specifically designed for cleaning-in-place (CIP). By this a thorough cleaning can be achieved simply by circulating cleaning fluids, without manually opening of the bowl. For this purpose 12 spring-loaded CIP-valves are fitted to the bowl periphery. The valves open when the bowl speed drops below a certain level. By means of back flushing with cleaning fluids through the paring disk, disk stack and paring tube the separator is completely cleaned and drained. The sequence of the CIP programme is designed to suit the specific customer requirements.

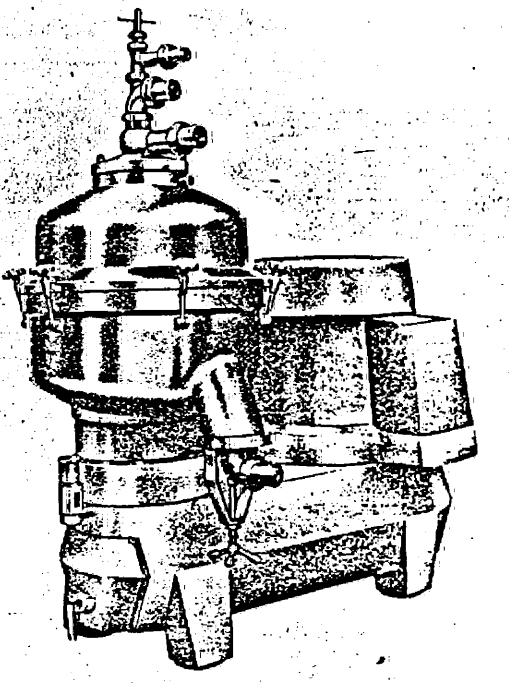

Fig. 1. FEUX 512U with lower frame designed for belt drive from a vertical motor.

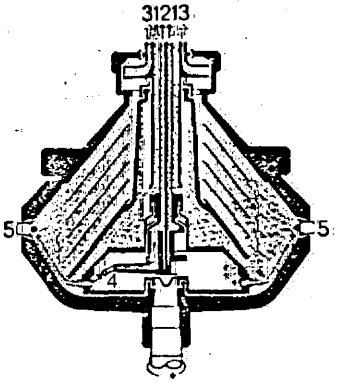

Fig. 2. Longitudinal section through the bowl showing inlet (1), outlet for concentrate (2), outlet for effluent (3), and the paring tube for pressure discharge of the concentrate (4). CIP nozzles (5).

The solids, being heavier, are forced outwards to the bowl periphery, through the concentrate pipes and the internal nozzles into the paring chamber where it is skimmed off by the paring tube and discharged. The lighter effluent is displaced towards the centre and leaves the bowl through the paring disk pump.

No. PD 40404E

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

FEUX 512

Standard versions

With paring disk pump for effluent and fixed paring tube for concentrate: FEUX 512T-31C.

As above but with adjustable paring tube to enable regulation of the yeast concentration: FEUX 512U-31C.

Performance

Throughputs up to 80,000 l/h (17,600 gph). The actual throughputs depend on such variables as viscosity, temperature, amount, type and size of solids and degree of clarification required.

Typical capacity data for some applications:

Baker's yeast	50—80 m³/h
Fodder yeast	30—50 m³/h
Bacteria separation (pharmaceuticals)	3—20 m³/h

Design

The bowl is of the solids-discharging type with nozzles fitted at the innermost end of each of the 12 concentrate tubes leading to the paring tube chamber.

The machine comprises a frame containing a drive system with a rigid coupling, flat belt with pulley, lubricating oil bath with integral oil pump and vertical bowl spindle built into a cartridge unit. The bowl is fixed on top of the spindle inside the space formed by the upper part of the frame and the covers. The vertical spindle cartridge (see Fig. 4) can be readily removed for maintenance. The belt is easily replaceable.

Materials: Frame — cast iron (Centriblue* finish), **frame hood, bowl hood and body, disks, lock ring, inlet and outlet systems** — stainless steel.

Dimensions

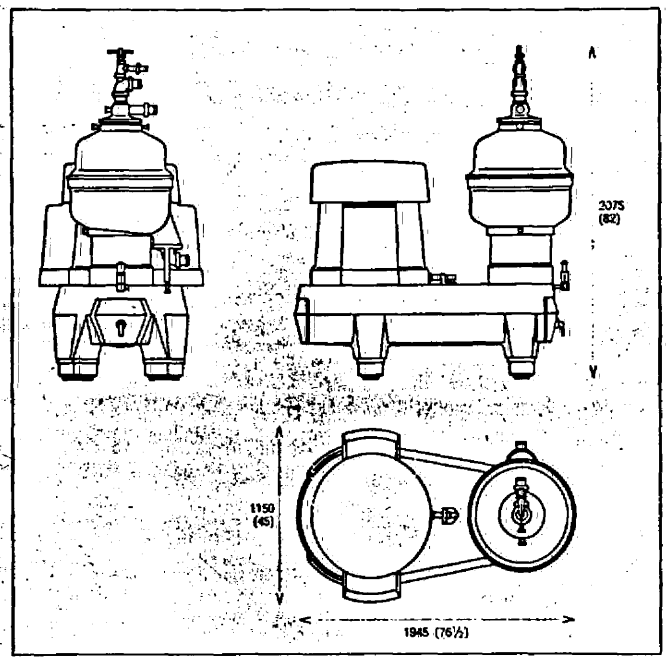

Fig. 3. Overall dimensions of FEUX 512U with belt drive. Measurements in mm (in).

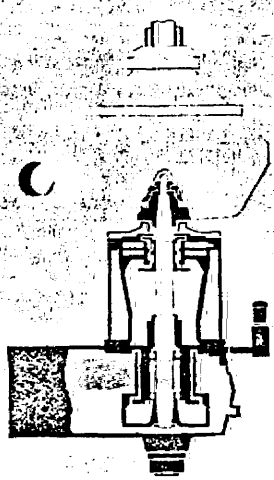

Fig. 4. Longitudinal section showing spindle cartridge and belt drive.

Standard equipment

Inlet and outlet bends, speed sensor, vibration dampers, standard set of spares, oil-pressure switch, and vibration switch.

Extra equipment

Set of spares for spindle cartridge.
Set of tools excl. tools for spindle cartridge.
Set of tools for spindle cartridge.
Electric flange motor.
Starter, star-delta switch, air break.
Flow meter in stainless steel.
Regulating valve in stainless steel.
Electro-magnetic bowl speed monitor and alarm relay.
Extra set of 12 nozzles (sapphire).
Strainer.

Technical data

Motor arrangement:
Vertically mounted belt drive motor recommended size 55 kW (alt. 37, 45 or 75 kW).

Connections:
Feed inlet: 2 ½" (63 mm).
Concentrate outlet: 1 ½" (38 mm).
Liquid outlet: 2 ½" (63 mm).
Inlet for flushing water: ½" (13 mm).
Outlet for flushing water: 2 ½" (63 mm).

Concentrate outlet pressure:
Up to 5 kp/cm² (70 psi)

Shipping data

Approximate weights and volume excluding motor and tools.

Net	1,950 kg
Gross	2,250 kg
Motor, net	475 kg
Volume	7 m³

Ordering

When ordering, please state main voltage, type and frequency of current, approx. operating capacity and liquid data.

*) An epoxy enamel.

ALFA-LAVAL

No. PD 40404E
Rep. 33465
512

The manufacturer reserves the right to change specifications without notice
Printed in Sweden by Sandgrens, Tumba

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Source: https://www.industrydocuments.ucsf.edu/docs/hhy40000

ALFA-LAVAL

Solids-discharging nozzle separator
Model FEUX 512U-31C

Specification number 881020-02-00

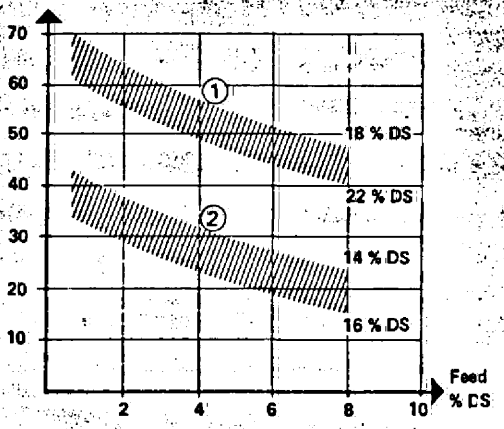
Application

Separation and washing of baker's and distiller's yeast, fodder yeast, and other microorganisms from fermentation broths.

Capacity

Throughputs
Baker's yeast 50 – 80 m^3/h
Fodder yeast 30 – 50 m^3/h.

Throughput, m^3/h



① = Baker's yeast (Saccharomyces)
② = Fodder yeast (Torula)
14 - 22 % DS in the concentrate 0.015 % DS in the effluent.

CIP valves

12 spring-loaded, evenly spaced at max. bowl periphery.

Nozzles

12 fitted to concentrate tubes, which feed the concentrate from the bowl periphery into a paring tube chamber.

Nozzle ø = mm	Paring tube diameter, mm	Max. yeast concentrate flow through all nozzles, l/h, calculated on water
0.70	5	980
0.80	5	1280
0.90	5	1620
1.00	5; 8	2000
1.15	8	2660
1.30	8	3390
1.45	8	4200
1.60	8	5120
1.80	8	6480
2.00	8; 10	8000
2.25	10	10100
2.50	10	12500
2.75	10	14500

Paring tube

Concentrate outlet pressure up to 0.6 MPa.
The paring tube is adjustable.

Formula to calculate the nozzle and tube size:

$B = \frac{a \cdot A}{b}$, where A = feed, m^3/h
a = % DS in the feed
B = flow through the nozzles, m^3/h
b = desired % DS in the concentrate.

Example: a = 2.5 %, b = 20 % DS. The performance graph shows that A = 60. B, the flow through the nozzles, is then 7.5 m^3/h.

The nozzle throughput table gives nozzle ø = 2.00.

Paring-disk pump

Effluent outlet pressure up to 0.8 MPa.

Caulk thickness

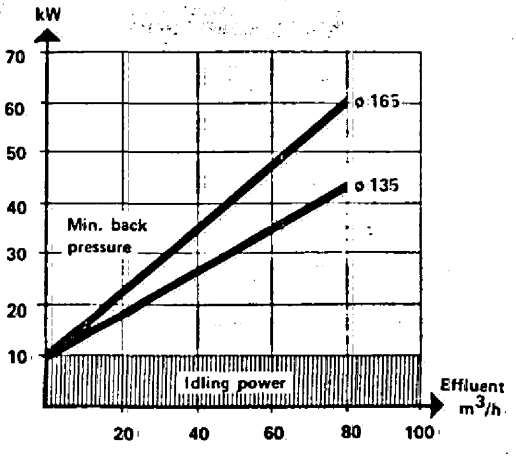
0.5 mm.

Electric motor

Vertically mounted, special motor
Recommended rated output 55 kW. 45 or 75 kW available.

Power consumption

Example on calculating the power consumtion:
The paring tube power for 7.5 m^3 is 17 kW with the tube in its outer position.
The throughput is 60 m^3/h, and therefore 52.5 m^3 effluent per hour will leave the separator.
The effluent and idling power with paring disk ø 135 mm is min. 31 kW. The total power consumption is the sum of the idling, effluent, and nozzle power, i.e. 48 kW.



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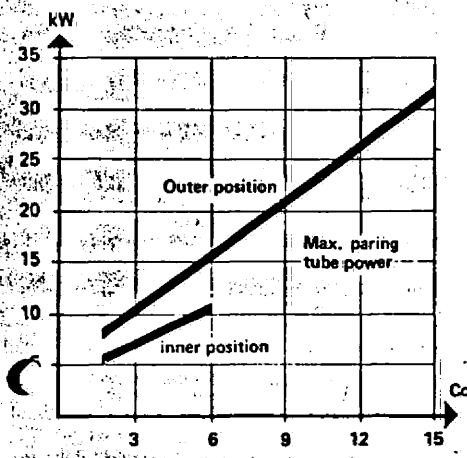
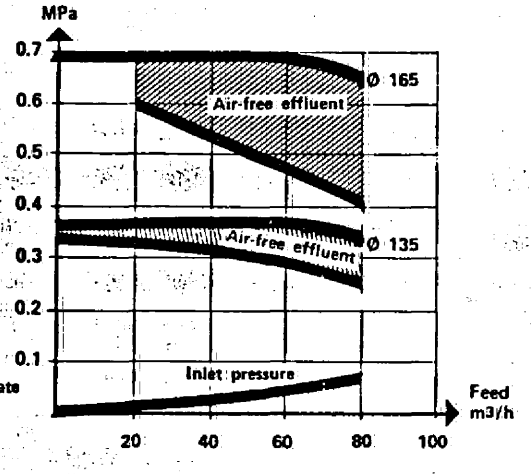
FEUX 512U

POWER CONSUMPTION



Inlet and outlet pressures



Speed

The prescribed speed, which must not be exceeded, is stamped on the name plate of the machine.

	50 Hz	60 Hz
Drive motor	2920 rpm	3500 rpm
Bowl spindle	5150 rpm	5150 rpm

Starting time

Approx. 3 minutes.

Stopping time

Approx. 12 minutes. (Running out with mechanical brake applied, closed nozzles.)

Starting-up, stopping, and emergency stop water

The bowl must always be cleaned before starting-up. In case of vibration, failure on feed, air, or current, the bowl must be kept filled with water.

Connections

See attached dimensional drawing.

Necessary and extra equipment

See separate compilation on recommended equipment.

Materials

Molybdenum alloyed stainless steel
Small lock ring, paring chamber, paring disk, large lock ring, CIP-nozzles, bowl hood, intermediate disks, distributor, cap nut, paring tube chamber, paring tube, nozzles, concentrate tubes, frame top part, frame hood, bowl body.

Cast iron (»Centriblue« epoxy enamel finish)
Frame bottom part.

Shipping data

Approx. weights and volumes, excl. motor

Net weight	1590 kg	(4500 lb)
Gross weight	1890 kg	(5170 lb)
Volume	7 m^3	(250 ft^3)

o PC 30716E
Reg. 33485
7702

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Source: https://www.industrydocuments.ucsf.edu/docs/hhy10000

GROUP 05 - EV - 01

Three stage Vacuum Falling Film Evaporating Plant with mechanical vapour recompressor with extremely little energy requirement.

For SEL - Extract.

10033384225

10033384225

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Evaporation plant:		3 effects with mechanic vapour recompression and drive by electric motor
Technical data:		
concentration of		tobacco extract
feed - quantity		25.670 kg/hr 26,7
- concentration		3 % TS 6,4%
- temperature		30 °C
concentrate - quantity		8560 kg/hr 20,1 m³/h.
- concentration		9 % TS 8,5%
- temperature		61 °C
water evaporation		~~17.110~~ 300 kg/hr 6600 kg/h.
Description of the plant		
type of plant		falling-film evaporation plant
number of effects		3
number of calandrias		3
arrangement of the effects (sequence as passed by the product)		1 - 2 - 3
type of preheater		plate and spiral-tube preheater
vapour compression		mechanic vapour recompression
condensation system		surface condensation
vacuum unit		liquid ring vacuum pump
Process data:		
product preheating		to appr. 72 °C
boiling temperatures	effect 1	68 °C
	effect 2	65 °C
	effect 3	61 °C

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Energies

saturated steam of 4 bar g for preheating and control of the plant	appr. 100 kg/hr →
connected value for electric energy for product and condensate as well as vacuum pumps	appr. 50 kW
capacity of the electromotor for the compressor drive	appr. 200 kW
power absorption of the compressor	appr. 140 kW
consumption of cooling water for the vacuum pump	appr. 2 m^3/hr
condensate outlet	

Operating cycle:

10 - 14 hours/day	processing of product
2 hours/day	cleaning
1 hour/day	start-up and shut-off of the plant

space requirement:	falling-film evaporator
floor space	appr. 10 x 5 m
height	appr. 14 m
	mechanic vapour recompressor and drive motor
floor space	appr. 4 x 3 m
height	appr. 4 m

1003384227

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Conditions for providing energy

1) The steam pressure upstream from the steam header is 4 bar g.

2) For the pneumatic measuring and control equipment the following has to be available:
   air of a pressure of 5 bar g.
   fluctuations ± 0,5 bar
   quality: oil and water free

3) Electric energy:
   operating voltage for all motors
   220/380 V, 50 cycles, 3 phases.

4) Cooling water
   of 25°C and a pressure of approx. 3 bar g.

SCOPE OF SUPPLY:

- 3 evaporating bodies with separators
- 1 surface condenser
- 3 spiral tube pre-heaters
- 2 plate pre-heaters
- 10 product pumps
- 2 vacuum pumps
- 1 condensate pump
- 1 float balance tank
- 1 upper service platform
- 1 supporting structure
- 1 centrifugal compressor with electromotor as drive
- fittings and pipework
- preparation for the installation

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1003384228

Source: https://www.industrydocuments.ucsf.edu/docs/hbyl0000

GENERAL PLANT AND EQUIPMENT DESCRIPTION:

The Wiegand vacuum falling-film evaporation plant consists of homogeneous elements which are described in the following:

Evaporating body for falling-film:

type of construction:

vertical calandria with removable cover in the upper part, manhole in the lower part, separator arranged laterally.

Surface finish:

heating tubes: internal surfaces will be cold rolled, the zones around the welds will be smoothed by an additional rolling process;

other surfaces entering into contact with the product will be manufactured from cold rolled sheets with ground welds.

outside of the equipment: non-ground

Moreover:

sight glasses in the lower part of the calandria on product and condensate side,

sight glasses in separator, incl. light hood (without electric installation).

Spiral tube pre-heater

made of CrNi-steel, installed into the a.m. calandrias.

Surface condenser

with tubes, tube sheet and jacket of CrNi-steel, cooling water caps also of CrNi-steel.

Float balance tank

for the product to be concentrated: made of CrNi-steel complete with two float valves for product and condensate, only opening in the event of product failure, in order to prevent the evaporator from running dry.

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1003384229

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Liquid ring vacuum pump

to produce and maintain the operating vacuum: complete with driving motor, coupling and base plate.

Product pumps

(feed, intermediate transfer and concentrate pumps), as centrifugal pumps with open impeller, on product side completely of CrNi-steel, complete with enclosed driving motor for 3-phase current 220/380 V, 50 cycles.
Pressure head downstream from the concentrate pump approx. 10 m WG, measured at the pressure socket of pump.

Vapour condensate transfer pumps

of the same design as the product pumps,
pressure head downstream from the pumps approx. 10 m WG, measured at the pressure socket of pumps.

Supporting structure

constructed as supporting elements, made of CrNi-steel, underneath the calandrias and separators, provided for placing the plant on a plane foundation to be provided by the customer.

Upper service platform

with galvanized open mesh flooring, hand-rail and ladder where necessary.

The necessary rough and fine fittings, such as:

- 1 flowmeter of dairy design, made of CrNi-steel
- 1 precision regulating valve as feed valve, made of CrNi-steel
- the steam and cooling water valves necessary within the scope of supply
- venting and discharge valves
- pressure gauges and thermometers.

Preparation of the plant for installation on site

including checking of the components by a hydraulic test and gas leakage testing.

The stainless steel parts will be cleanly pickled and brushed on the outside.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Centrifugal comoressor

The volute casing will be made of stainless steel. The compressor impeller will be an open impeller with radial blades in steel, welded; tested with 15% oversoeed and balanced at nominal speed (material: X10crmo13).

Shaft sealed with labyrinth bushing with shaft protection bushing.

Spin bearing - tilted segment bearing
Thrust bearing - tilted segment bearing

During compressor operation, deposits forming on the impeller can be removed by a water injection system.

There is the possibility of rebalancing the impeller without disassembling it, if the unbalance becomes excessive due to corrosion or solid deposits. In that case, the unbalance will be removed by inserting screws into balance ring on the rear side of the impeller (threaded holes are provided).

At its lowest point the compressor casing will be fitted with a draining valve and a condensing device so that tne condensate produced during pre-heating of the plant may be eliminated.

Accessories:

- 1 base frame for the compressor, gear and electromotor
- 1 turbo spur gear
- 1 flexible coupling with coupling guard between gear and motor
- 1 turbo gear-wheel coupling with coupling guard between gear and motor
- 1 lubricating oil system for the compressor, gear and turbo gear-wheel coupling, consisting of:
  - oil container with main and auxiliary oil pump for 100%
  - 1 oil cooler for 1 x 100%
  - 1 switchable double oil filter for 2 x 100%

The instruments to supervise the unit are included, as well as the connecting pipework.

1003384231

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

SAFETY EQUIPMENT

- 1 shaft position indication (axial shift), 1 channel
- 1 shaft vibration indication
- pump limit control, consisting of:
  - 1 flow-measuring instrument (Annubar), suction-side
  - 1 differential pressure-measuring instrument
  - 1 compact controller
  - 1 control valve

Driving motor for 3-phase current 220/380 V, 50 cycles, for $y\Delta$ start.

CIP nozzle system

To improve the chemical cleaning of the evaporation plant a special system of spray nozzles is recommended. The lower tube sheets and upper parts of the separators, in particular, will be rinsed better. The scope of supply comprises the cleaning nozzles of CrNi-steel, the supply tubes with shut-off valves of CrNi-steel. This system will be provided for each calandria and separator.

In addition, the material necessary for the installation of these parts into the plant and the expenditure for the preliminary construction will be taken into account. Moreover, the product pumps which supply the nozzles during cleaning will be reinforced. The necessary pipework for the interconnection of the a.m. parts is provided.

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Source: https://www.industrydocuments.ucsf.edu/docs/hnyl0000

All parts coming into contact with the product, the vapour, and the vapour condensate will be made of CrNi-steel, the product lines with milk fittings according to DIN 11851 or flanges in CrNi-steel.

Price: see last page of the quotation

Pneumatic CIP valves

The shut-off devices provided can be equipped with pneumatic drive. Handling can be done centrally from the control panel.

Compressed air of approx. 6 bar must be made available by the customer.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

CONTROL SYSTEM

The function of the basic control equipment is to keep constant the energy variables which influence the evaporation plant from outside. These are, in particular, the operating vacuum and temperatures, as well as the product rates being fed in and discharged.

A preliminary condition for the control system is that a steam pressure of at least 8 bar g is made available by the customer; a safety valve is provided which blows off at max. 13 bar g.

Vacuum control loop

This control loop stabilizes the operating pressure in the condenser and thus the boiling temperature of the last evaporating effect.

Flow control

With this control loop the feed rate is measured and controlled.

Control loop final concentration or density

This control loop measures continuously the final concentration and modifies the energy supply of the plant according to the value measured there.

These control loops consist of:

- transmitters
- controllers
- positioning devices
- control valves, as well as the material necessary to insert the control valves into the pipework system, incl. companion flanges and gaskets, plus the assembly material to connect with the control panel those parts of the control system which are mounted within the plant (pneumatic wiring).

The density control loop furthermore comprises the density measuring device operating on the basis of specific gravity.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Conductivity control

The quality of the condensate can be supervised by control of the conductivity. The conductivity value is measured continuously. When it exceeds a certain value, which can be set in advance, there will be a change-over of the condensate flow. Each of the two condensate flows of the evaporation plant will be furnished with such a supervisory device.

The scope of supply consists of a special electrode, including mounting part of CrNi-steel to be installed into the condensate line, a controller, as well as a pneumatic 3-way valve of CrNi-steel, plus the material necessary for the installation and the appropriate diagrams.

Pneumatic 3-line recorder

To record the most important data of the evaporation plant (steam pressure upstream from the steam header, heating temperature and final concentration), we recommend a pneumatic 3-line recorder.

Control panel

This control panel serves to locate the a.m. control instruments and positioning instruments. The control panel is planned to be made of CrNi-steel and will be supplied completely wired. The control panel will be provided for free arrangement with doors in the rear, cable inlet and outlet on the bottom side.

Behind the control panel, a space of at least 700 mm in depth must be taken into account. The control panel will furthermore be furnished with a mimic diagram of the plant in Formica.

Supervisory equipment

for the mechanic vapour recompressor, including driving system, is a component of the compressor.

10033384235

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

3.5 ITEM o5 - EV - 01.1

Three stage vacuum falling-film evaporating plant with thermo-compressor and surface condenser of special design.

For the RL Extract.

1003384236

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

SPECIFICATION

Capacity and Operational Data:

Product

inlet	- concentration	9% TS
	- quantity	8560 kg/h für 22h-Operation
	- temperature	min. 50°C
evaporating capacity		7000 kg/h
outlet	- concentration	48% TS
	- quantity	1600 kg/h
	- temperature	50°C

Temperatures

	from to		
preheating evaporation	1st stage	2nd stage	3rd stage
boiling temperatures °C	75	65	50
steam consumption	approx. 1950 kg/h incl. preheating that is, 28% related to the evporating capacity		
steam consumption for the 2-stage steam jet vacuum pump	approx. 200 kg/h		

(These consumption data were determined with an assumed steam pressure of 3,5 bar).

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

circulated cooling water quantity when heating from 25 to 40°C	max. 80 m^3/h	
power required for the pumps	approx. 28 kW	
voltage	volts,	cycles
	220/380	3 pH 50 Hz

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

EQUIPMENT

Evaporating bodies

of special design for falling-film of calandrias with adjacent separators. The evaporating bodies are made of CrNi-steel on the product and vapour side, material No. 4301/5441, equivalent to quality V2A.

The calandrias are provided with hinged covers and are equipped with an easily opened manhole in the bottom, as are the centrifugal separators.

The separators are fitted with inspection and illuminating hoods. The heating tubes are planely drawn, all other parts in contact with the product are ground.

Straight-tube pre-heaters

to pre-heat the product: completely made of CrNi-steel.

Surface condenser

for the residual vapour of the pre-evaporator: the parts in contact with the product and vapours made of CrNi-steel, i.e. tubes and tube sheet as well as shell in CrNi-steel, cooling water caps in mild steel.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Steam jet thermo-compressor

of low noise design, completely in CrNi-steel.

Steam jet vacuum pump

consisting of 2 steam jet air ejectors with motive nozzles in CrNi-steel and the condensation surface belonging thereto.

Product pumps

(feed, intermediate supply, and concentrate pumps with a delivery head of 30 m WG),
as centrifugal pumps with open impellers,
product side completely in CrNi-steel,
complete with enclosed-type driving motor;
incl. tropical insulation with increased protection against tropical climate.

Vapour condensate pumps.

of the same design as the product pumps;
complete with driving motor.
Delivery head of each pump: 20 m WG

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Source: https://www.industrydocuments.ucsf.edu/docs/nhyl0000

Float balance tank

for the product to be concentrated, in stainless steel, complete with 2 float valves for product and condensate, only opening in the event of product failure in order to prevent the plant from running dry.

The required connecting lines and fittings to connect this tank with the other parts of the evaporating plant will also be supplied.

Supporting structure

to locate the above-described equipment, in mild steel.

Upper service platform

in mild steel with hand-rail and ladder.
The platform cannot be supported at the wall.

The required pipework

for the interconnection of the above parts.
All pipes in contact with the product, the vapour and the vapour condensate will be made of CrNi-steel, the product lines with fittings according to DIN 11851 (milk fittings) and of sanitary design.

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1003384241

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

The required rough and fine fittings

such as:

- flowmeters in CrNi-steel
- precision regulating valve as feed valve also in CrNi-steel
- the steam and cooling water valves required within the scope of supply, the discharge and venting valves
- pressure gauges and thermometers

The automatic control system of the evaporating plant

Our suggestion for the equipment of the above-described plant with control systems is based on the assumption that a controlled steam pressure of at least 8 bar g is made available by the customer. The control is based on the assumption that the most important values entering the plant are kept constant. Within the normal scope of supply the float balance tank with feed pump already represents a certain control loop, as the level in the float balance tank will be controlled by the float valve.

For the plant the steam pressure is to be constantly controlled at the steam header, in order to have the most favourable pre-condition for all energy consumers, especially for all jet pumps, from that point.

Furthermore, the boiling pressure at the condenser, i.e. the operating vacuum, will be controlled constantly in order to keep this important part under control too.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

For the supervision and the continuous control of the concentration or the density, we suggest using a control loop, which supervises the outlet concentration and influences the energy going to the evaporator.

The scope of supply of the individual electric control loops should comprise:

1. feed control with inductive flowmeter
2. steam pressure control for the main steam header
3. vacuum control for the pre-evaporator and vacuum adjustment for the finisher
4. density control and control of the concentration for the finisher (measurement of the difference in pressure).

These control loops consist of:

- transmitters, controllers, regulating assemblies, control valves and, for the density control loop, the density-meter, as well as the material necessary to install the regulating elements and the density-meter into the pipework, including the shut-off valves for the density-meter.

Compressor

The total wiring for the air station and the compressor will be supplied.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Control panel

This control panel serves for the location of the above-mentioned control loops and the regulating instruments. The control panel is planned to be in stainless steel. It is detached and easily accessible from behind. The panel will be supplied completely wired. It will furthermore be equipped with the switches to switch the pumps on and off (without contactors).

The control panel will further be provided with a mimic diagram of the evaporating plant.

Installed into the control panel are the indicating instruments for the remote indication of the most important temperatures within the evaporating plant; furthermore, a 6-line recorder indicates the feed steam pressure, vacuum and density.

The scope of supply should also comprise:

the pneumatic and electric material for the assembly including the protection tubes within the evaporating plant.

Maximum dimensions: 1800 mm x 1160 mm x 700 mm

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyf0000

3.6 POS. 06 - EV - 01

Three stage vacuum falling-film evaporating plant with thermo compressor and surface condenser of special design.

For the Ninomass.

1003384246

1003384246

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

SPECIFICATION

Capacity and Operational Data:

Product

inlet	- concentration	18% TS
	- quantity	3535 kg/h für 22h-Operation
	- temperature	min. 30°C
evaporating capacity		1135 kg/h
outlet	- concentration	25 % TS
	- quantity	2400 kg/h
	- temperature	50°C

Temperatures

preheating	from	to	°C
evaporation	1st stage	2nd stage	3rd stage
boiling temperatures °C	75	65	50
steam consumption	approx. 348,4 kg/h incl. preheating, that is, 30,7% related to the evporating capacity		
steam consumption for the 2-stage steam jet vacuum pump	approx. 75 kg/h		

(These consumption data were determined with an assumed steam pressure of 3,5 bar).

1003384247

1003384247

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

circulated cooling water quantity when heating from 25 to 40°C	max. 25 m^3/h
power required for the pumps	approx. 20 kW
voltage	220/380 V 3 ph 50 Hz

1003384248

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

EQUIPMENT

Evaporating bodies

of special design for falling-film of calandrias with adjacent separators. The evaporating bodies are made of CrNi-steel on the product and vapour side, material No. 4301/5441, equivalent to quality V2A.

The calandrias are provided with hinged covers and are equipped with an easily opened manhole in the bottom, as are the centrifugal separators.

The separators are fitted with inspection and illuminating hoods. The heating tubes are planely drawn, all other parts in contact with the product are ground.

Straight-tube pre-heaters

to pre-heat the product: completely made of CrNi-steel.

Surface condenser

for the residual vapour of the pre-evaporator: the parts in contact with the product and vapours made of CrNi-steel, i.e. tubes and tube sheet as well as shell in CrNi-steel, cooling water caps in mild steel.

1003384249

1003384249

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Steam jet thermo-compressor

of low noise design, completely in CrNi-steel.

Steam jet vacuum pump

consisting of 2 steam jet air ejectors with motive nozzles in CrNi-steel and the condensation surface belonging thereto.

Product pumps

(feed, intermediate supply, and concentrate pumps with a delivery head of 30 m WG),
as centrifugal pumps with open impellers,
product side completely in CrNi-steel,
complete with enclosed-type driving motor;
incl. tropical insulation with increased protection against tropical climate.

Vapour condensate pumps.

of the same design as the product pumps;
complete with driving motor.
Delivery head of each pump: 20 m WG

1003384250

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Float balance tank

for the product to be concentrated, in stainless steel, complete with 2 float valves for product and condensate, only opening in the event of product failure in order to prevent the plant from running dry.

The required connecting lines and fittings to connect this tank with the other parts of the evaporating plant will also be supplied.

Supporting structure

to locate the above-described equipment, in mild steel.

Upper service platform

in mild steel with hand-rail and ladder.
The platform cannot be supported at the wall.

The required pipework

for the interconnection of the above parts.
All pipes in contact with the product, the vapour and the vapour condensate will be made of CrNi-steel, the product lines with fittings according to DIN 11851 (milk fittings) and of sanitary design.

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1003384251

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

The required rough and fine fittings

such as:

- flowmeters in CrNi-steel
- precision regulating valve as feed valve also in CrNi-steel
- the steam and cooling water valves required within the scope of supply, the discharge and venting valves
- pressure gauges and thermometers

The automatic control system of the evaporating plant

Our suggestion for the equipment of the above-described plant with control systems is based on the assumption that a controlled steam pressure of at least 8 bar g is made available by the customer. The control is based on the assumption that the most important values entering the plant are kept constant. Within the normal scope of supply the float balance tank with feed pump already represents a certain control loop, as the level in the float balance tank will be controlled by the float valve.

For the plant the steam pressure is to be constantly controlled at the steam header, in order to have the most favourable pre-condition for all energy consumers, especially for all jet pumps, from that point.

Furthermore, the boiling pressure at the condenser, i.e. the operating vacuum, will be controlled constantly in order to keep this important part under control too.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

For the supervision and the continuous control of the concentration or the density, we suggest using a control loop, which supervises the outlet concentration and influences the energy going to the evaporator.

The scope of supply of the individual electric control loops should comprise:

1. feed control with inductive flowmeter
2. steam pressure control for the main steam header
3. vacuum control for the pre-evaporator and vacuum adjustment for the finisher
4. density control and control of the concentration for the finisher (measurement of the difference in pressure).

<u>These control loops consist of</u>:

- transmitters, controllers, regulating assemblies, control valves and, for the density control loop, the density-meter, as well as the material necessary to install the regulating elements and the density-meter into the pipework, including the shut-off valves for the density-meter.

<u>Compressor</u>

The total wiring for the air station and the compressor will be supplied.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Control panel

This control panel serves for the location of the above-mentioned control loops and the regulating instruments. The control panel is planned to be in stainless steel. It is detached and easily accessible from behind. The panel will be supplied completely wired. It will furthermore be equipped with the switches to switch the pumps on and off (without contactors).

The control panel will further be provided with a mimic diagram of the evaporating plant.

Installed into the control panel are the indicating instruments for the remote indication of the most important temperatures within the evaporating plant; furthermore, a 6-line recorder indicates the feed steam pressure, vacuum and density.

The scope of supply should also comprise:

the pneumatic and electric material for the assembly including the protection tubes within the evaporating plant.

Maximum dimensions: 1800 mm x 1160 mm x 700 mm

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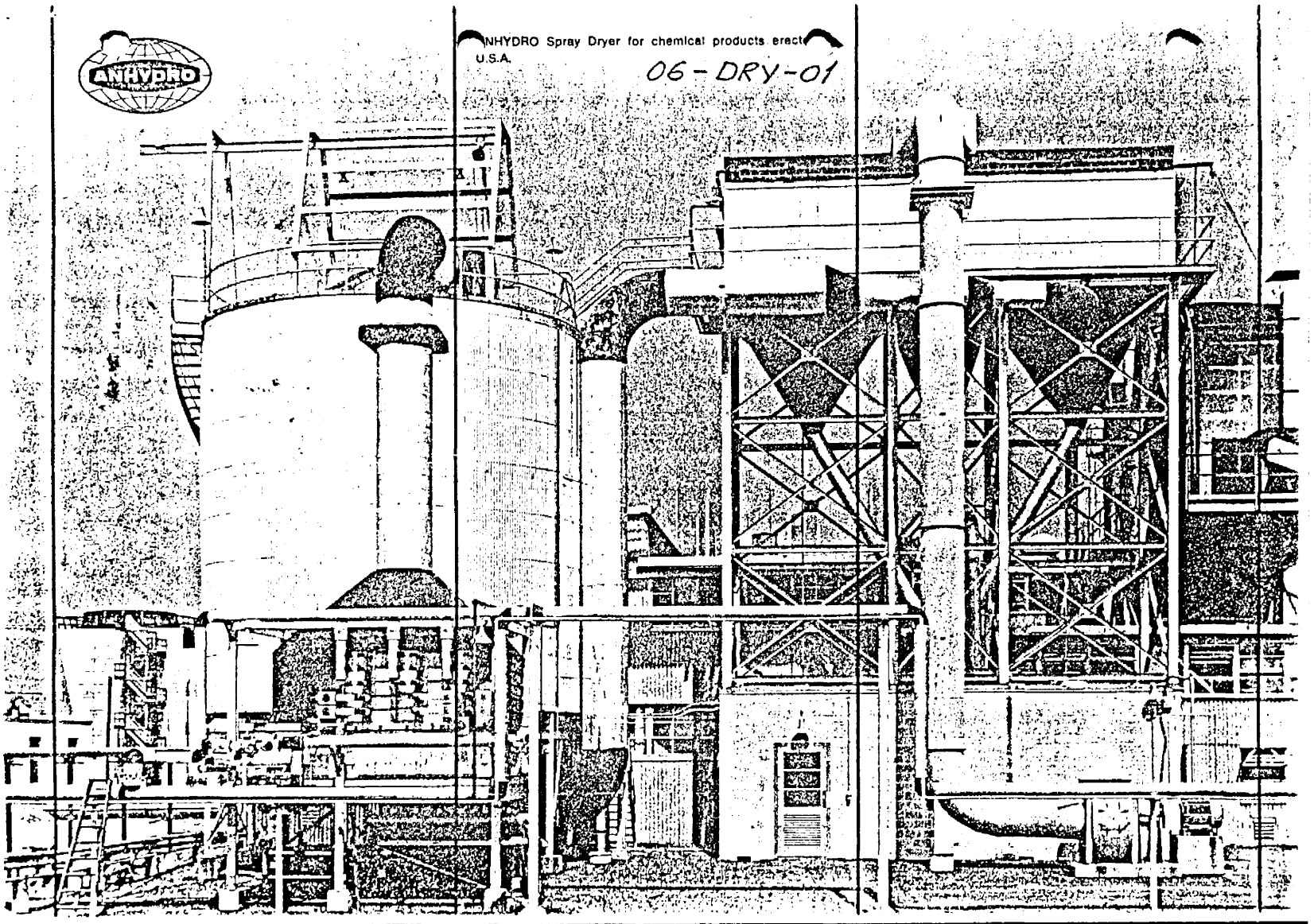
Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

1003384255



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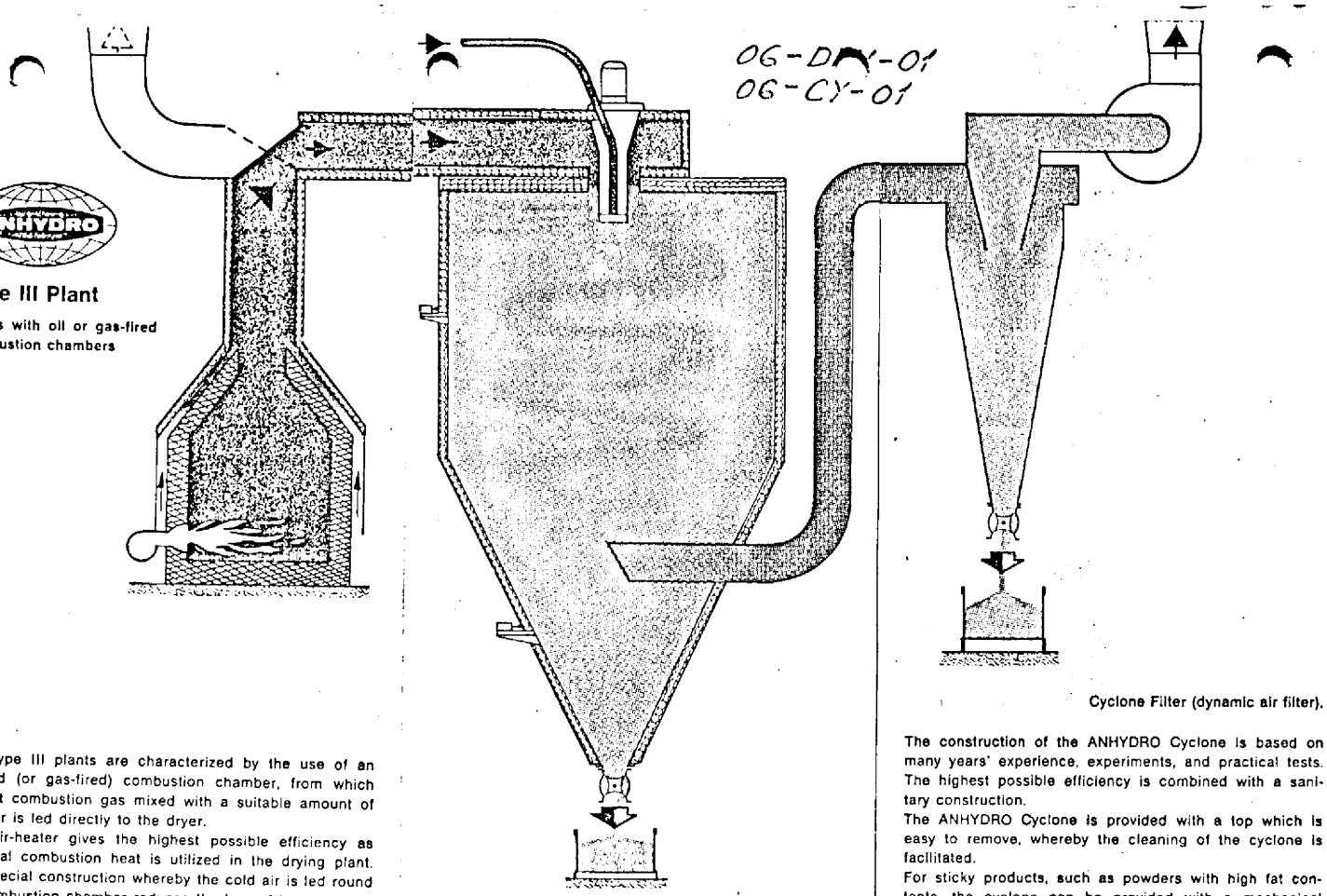
Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

1003384256



OG-DRY-01
OG-CY-01

Type III Plant

Plants with oil or gas-fired combustion chambers

The Type III plants are characterized by the use of an oil-fired (or gas-fired) combustion chamber, from which the hot combustion gas mixed with a suitable amount of cold air is led directly to the dryer.
This air-heater gives the highest possible efficiency as the total combustion heat is utilized in the drying plant. The special construction whereby the cold air is led round the combustion chamber reduces the loss of heat to practically nothing.
For this air-heater a light fuel oil is generally used, but the burner can also be adapted to take heavy fuel oils as well as gas.
This type of plant is particularly suitable for drying of chemicals, ceramic products etc., which are not sensitive to the combustion gases.

9a

Chamber with conical bottom for minimum mechanical handling of the powder. This design is also particularly suitable for nozzle atomization. Subsequent powder cooling often takes place in a fluid bed.

9b

Cyclone Filter (dynamic air filter).

The construction of the ANHYDRO Cyclone is based on many years' experience, experiments, and practical tests. The highest possible efficiency is combined with a sanitary construction.
The ANHYDRO Cyclone is provided with a top which is easy to remove, whereby the cleaning of the cyclone is facilitated.
For sticky products, such as powders with high fat contents, the cyclone can be provided with a mechanical scraper to prevent the accumulation of material in the cyclone.
The powder is usually discharged by means of a rotary valve. In special cases, this valve can be dispensed with, e. g., if the cyclone is built together with a closed powder container or attached to a pneumatic conveying and cooling system.

5c

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

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Spray Dryers, Type III (Oil or gas combustion chambers)

Type III is designed for drying at high temperatures, using the combustion products from an oil or gas burner as drying medium. Therefore, the plant is mostly used for the drying of chemicals and ceramics. This type of plant has been designed to ensure the best possible heat economy, and both as to purchase price and operational costs, this is our cheapest type of plant.

The table shows the capacities at alternative air temperatures of 215° C and 550° C and the corresponding figures for oil consumption. The capacities and the oil consumption for intermediate air temperatures can be calculated by simple interpolation. The figures stated are approximate and they may vary somewhat for the various types of products.

The use of very high air temperatures does not mean that the product, too, is heated to high temperatures as the quick evaporation gives an immediate drop in the temperature of the drying air.

The chamber is made of stainless steel or mild steel. The chamber is extremely well insulated, and is covered with metal sheets. Pneumatic powder-cooling and conveying systems are often included.

Size No.	Water evaporation				Oil consumption		Power consumption	Approx. space demand					Gross weight	Export volume
	kg/h*	lbs/h*	kg/h**	lbs/h**	kg/h*	kg/h**	kW	width m	length m	H_1 m	H_2 m	H_3 m	tons	m³
1	35	78	111	246	5	10	3-6	3	4	5.6	5.0	3.8	3-5	15-24
2	45	100	143	316	6	13	4-8	3	4	6.0	5.1	4.0	3-5	16-25
3	58	129	184	406	7	16	5-10	4	4	6.5	5.3	4.2	4-6	17-26
4	74	165	236	521	9	20	6-12	4	5	7.5	6.3	5.3	4-6	18-28
5	95	211	301	667	11	25	7-14	4	5	8.0	6.7	5.5	5-7	20-32
6	122	269	385	851	14	32	8-16	4	5	8.5	7.0	5.8	5-8	22-36
7	155	343	490	1084	18	40	10-20	4	6	8.8	7.4	6.1	5-9	25-40
8	197	436	622	1380	23	50	13-25	5	6	9.4	7.5	6.5	6-10	28-45
9	250	560	800	1800	28	80	16-32	5	6	10.8	8.8	7.5	7-12	36-56
10	315	710	1000	2240	36	80	20-40	5	7	11.5	9.5	8.0	8-14	45-71
11	400	800	1250	2800	45	100	25-50	6	7	12.0	10.0	8.5	10-17	56-90
12	500	1120	1600	3550	56	125	32-63	6	8	12.7	10.5	8.8	12-20	71-112
13	630	1400	2000	4500	71	160	40-80	7	8	13.6	11.0	9.2	15-24	90-140
14	800	1800	2500	5600	90	200	50-100	7	9	14.5	11.7	9.8	18-29	112-180
15	1000	2240	3150	7100	112	250	63-125	8	10	15.5	12.5	10.3	22-35	140-224
16	1250	2800	4000	9000	140	315	80-160	8	11	16.4	13.3	11.0	26-42	180-280
17	1600	3550	5000	11200	180	400	100-160	9	11	17.4	14.1	11.6	32-50	224-355
18	2000	4500	6300	14000	224	500	125-250	10	12	18.7	15.0	12.3	38-60	280-450
19	2500	5600	8000	18000	280	630	160-375	10	13	20.5	16.2	13.5	45-72	355-560
20	3150	7100	10000	22400	355	800	200-400	11	14	21.5	17.2	14.5	55-86	450-710
21	4000	9000	12500	28000	450	1000	250-500	12	15	23.5	19.5	16.0	65-104	560-900
22	5000	11200	16000	35500	560	1250	315-630	13	16	25.3	21.0	17.0	80-122	710-1120
23	6300	14000	20000	45000	710	1600	400-800	15	17	27.0	23.0	18.0	95-148	900-1400
24	8000	18000	25000	56000	900	2000	500-1000	17	19	29.0	24.5	19.5	111-180	1120-1800

* Based on air inlet temperature of 215° C (419° F). ** Based on air inlet temperature of 550° C (1022° F) H_1, H_2 and H_3: see drawing on next page.

Spraying Plants, Type IV (Spray-cooling – no heating)

The Type IV Plant operates without air heating. This plant is used for spray-cooling or spray-crystallization.

The molten products are led to the atomizer and are sprayed into cold air. The fine particles of the molten product are cooled and will solidify.

This type of plant is used for a great number of products, such as soda, soda-containing detergents, ammonium nitrate, Glauber's salt, stearic acid, resins, fats, waxes etc. If desired, the plant is provided with a dosing device for simultaneous addition of additives, such as perborate, calcium phosphate, or flour.

The chambers are mostly made of mild steel with an interior layer of plastic coating. The capacity of these plants depends to a great extent on the temperature of the surrounding air and on the temperature and solidification heat of the products to be spray-cooled.

The capacities shown in the table are, therefore, given with very wide limits and should be considered as a guide only.

Size No.	Powder capacity		Power consumption	Approx. space demand					Gross weight	Export volume
	kg/h	lbs/h	kW	width m	length m	H_1 m	H_2 m	H_3 m	tons	m³
1	63-200	140-450	2-4	3	4	5.6	5.0	3.8	3-4	12-19
2	80-250	180-560	2-5	3	4	6.0	5.1	4.0	3-5	13-20
3	100-315	224-710	3-6	4	4	6.5	5.3	4.2	3-5	14-21
4	125-400	280-900	4-8	4	5	7.5	6.3	5.3	3-6	15-22
5	160-500	355-1120	5-10	4	5	8.0	6.7	5.5	4-7	16-25
6	250-630	450-1400	6-13	4	5	8.5	7.0	5.8	4-7	18-26
7	250-800	560-1800	8-16	4	6	8.8	7.4	6.1	5-8	20-32
8	315-1000	710-2240	10-20	5	6	9.4	7.5	6.5	5-9	22-36
9	400-1250	900-2800	12-25	5	6	10.8	8.8	7.5	6-10	28-45
10	500-1600	1120-3550	16-32	5	7	11.5	9.5	8.0	7-12	36-56
11	630-2000	1400-4500	20-40	6	7	12.0	10.0	8.5	9-15	45-71
12	800-2500	1800-5600	25-50	6	8	12.7	10.5	8.8	11-18	56-90
13	1000-3150	2240-7100	32-63	7	8	13.6	11.0	9.2	13-21	71-112
14	1250-4000	2800-9000	40-80	7	9	14.5	11.7	9.8	16-25	90-140
15	1600-5000	3500-11200	50-100	8	10	15.5	12.5	10.3	19-30	112-180
16	2000-6300	4500-14000	63-125	8	11	16.4	13.3	11.0	23-37	140-224
17	2500-8000	5600-18000	80-160	9	11	17.4	14.1	11.6	27-45	180-280
18	3150-10000	7100-22400	100-200	10	12	18.7	15.0	12.3	33-53	224-355
19	4000-12500	9000-28000	125-250	10	13	20.5	16.2	13.5	40-63	280-450
20	5000-16000	11200-35500	160-315	11	14	21.5	17.2	14.5	48-77	355-560
21	6300-20000	14000-45000	200-400	12	15	23.5	19.5	16.0	58-94	450-710
22	8000-25000	18000-56000	250-500	13	16	25.3	21.0	17.0	70-110	560-900
23	10000-31500	22400-71000	315-630	15	17	27.0	23.0	18.0	85-132	710-1120
24	12500-40000	28000-90000	400-800	17	19	29.0	24.5	19.5	100-160	900-1400

H_1, H_2 and H_3: see drawing on next page.

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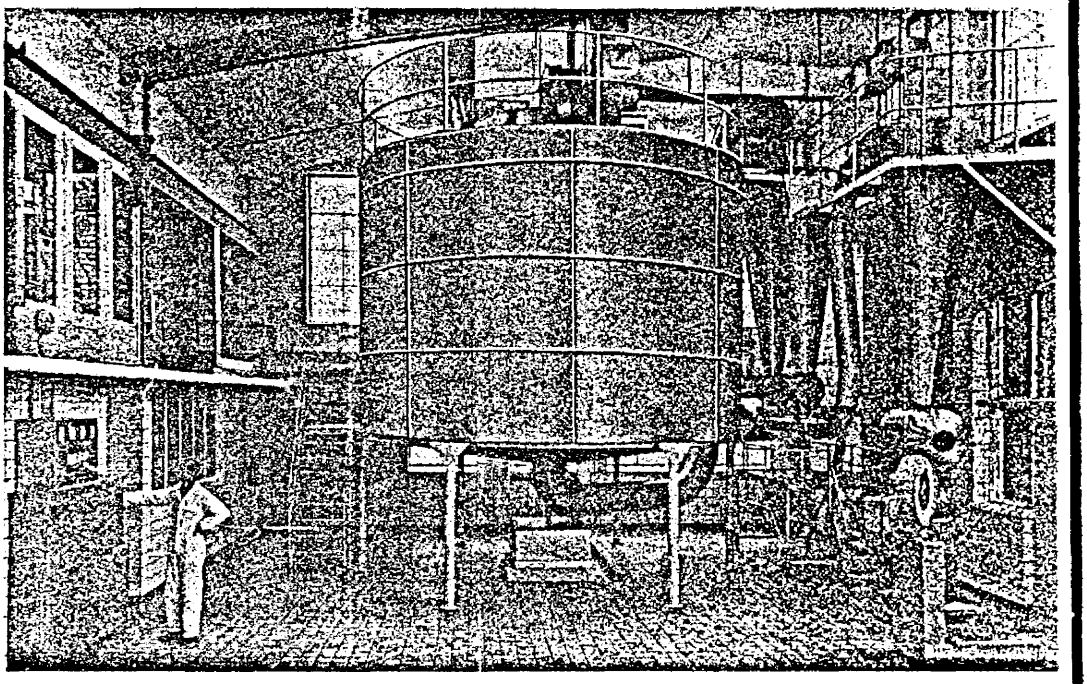
Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

ANHYDRO SPRAY DRY

– from liquid to powder in seconds through ANHYDRO SPRAY DRYERS



Automatic, continuously operating ANHYDRO Spray Drying Plant, in stainless steel, 350 kilos (770 lbs.) water evaporation/h

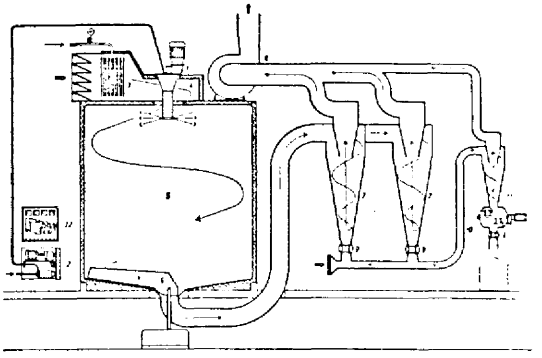
The continuous low cost process

Spray Drying is recognized as one of the best methods of drying solutions, emulsions and slurries. The spray drying process **is a single step, continuous** operation in which almost any pumpable true solution or slurry can be converted into a **free flowing powder** in **a few seconds.** This drying method is applicable to heat sensitive products, which have to meet the highest demands as regards to powder quality as well as to the production of bulk chemicals where the main reason for choosing this drying system is the low production costs.

Instant Drying provides high powder quality

The drying is achieved by spraying the feed in fine droplets into a drying chamber, through which hot air is drawn. The hot air supplies the necessary heat for the evaporation, which takes place almost instantaneously due to the very large liquid surface created by the atomization.

Though high air temperatures are often used, the product temperature remains at a low level during the drying process due to the quick evaporation. The air now containing the moisture is discharged from the plant by means of a fan after the powder has been separated in a dust filter. The powder can subsequently be cooled in a pneumatic powder cooling system.



Other general advantages

- reliable operation
- uniform product
- good reconstitution properties
- low maintenance costs
- low labour costs
- easily automatized process

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

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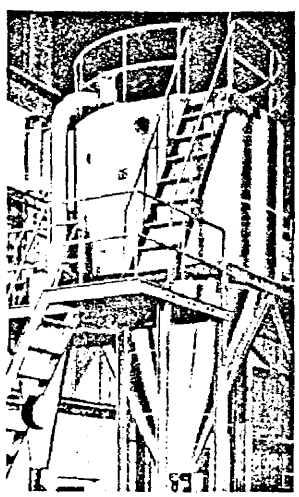
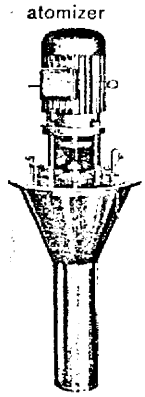
ANHYDRO



Medium size **ANHYDRO** centrifugal atomizer



Semi-industrial ANHYDRO Spray Drying Plant with conical drying chamber bottom. A wide range of our industrial dryer designs and sizes is available. Write for further information, bulletins and fully descriptive literature on ANHYDRO plants and equipment.

- robust construction
- reliable operation
- flat belt drive
- no auxiliary cooling
- simplified lubrication
- stainless steel

Atomizer design

The key to satisfactory spray drying is proper and controlled atomization giving a uniform particle distribution. The most versatile atomizing system is a centrifugal atomizer where the liquid is converted into a fine spray by being passed through an atomizer disc of special design revolving at a high speed. For special duties ANHYDRO spray dryers are fitted with pneumatic (two fluid) nozzles or pressure (single fluid) nozzles or with other atomization systems.

Air-Heater design

ANHYDRO Spray Drying Plants are equipped with steam air-heaters, indirect oil or gas-fired air-heaters or direct oil or gas-fired air-heaters. In some cases an electric air-heater is used, alone or to boost a steam air-heater.

Drying Chamber design

The drying chamber being made of stainless steel or mild steel is designed with a flat bottom with a pneumatic powder collector or with a conical bottom. The flat bottom design gives low building height, facilitates cleaning and the pneumatic powder removal secures brief residence time of the powder in the chamber. The conical bottom is used for products not suitable for pneumatic conveying. The air distributor is placed at the top of the drying chamber ensuring the ideal air distribution for a co-current or mixed current drying. All parts heated by the hot inlet air are placed outside the chamber. The dryers are delivered in 24 standard sizes designed to meet special product requirements and with water evaporation rates ranging from 5 kilos/h (10 lbs/h) to more than 25 tons/h.

Complete ANHYDRO Spray Drying Plant

- from initial intake to final discharge

1. Centrifugal Atomizer
2. Feed Pump
3. Steam Air-Heater
4. Air Distributor
5. Drying Chamber
6. Pneumatic Powder Collector
7. Cyclones
8. Exhaust Fan
9. Rotary Discharge Valves
10. Pneumatic Powder Cooling
11. Cyclone with Whirl Trap
12. Instrument Panel

ANHYDRO plants are engineered and built to meet customers' special requirements. They are designed to assure maximum flexibility and efficiency from the reception of the product to the final packing of the powder.

Powder Separation

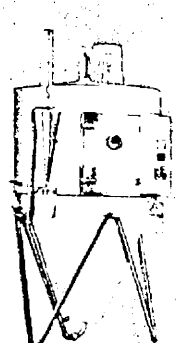
The powder is usually separated from the drying air in a dynamic filter consisting or highly efficient special cyclones. Subsequently the powder can be cooled in a pneumatic powder cooling system. In some cases the exhaust air is subject to a final cleaning in a bag dust collector or a wet scrubber.

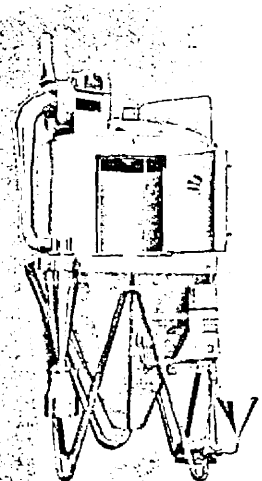
Spray Drying Plants are in operation for the following groups of products:

- dairy products
- eggs
- brewery products
- slaughterhouse products
- cereals
- other foods and feed stuffs
- fish soluble and fish pulp
- vegetable extracts
- pharmaceuticals
- plastics
- chemicals and fertilizers
- pigments
- ceramics
- soaps and detergents

ANHYDRO Laboratory and Pilot Spray Dryers

Write for bulletin 701.





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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

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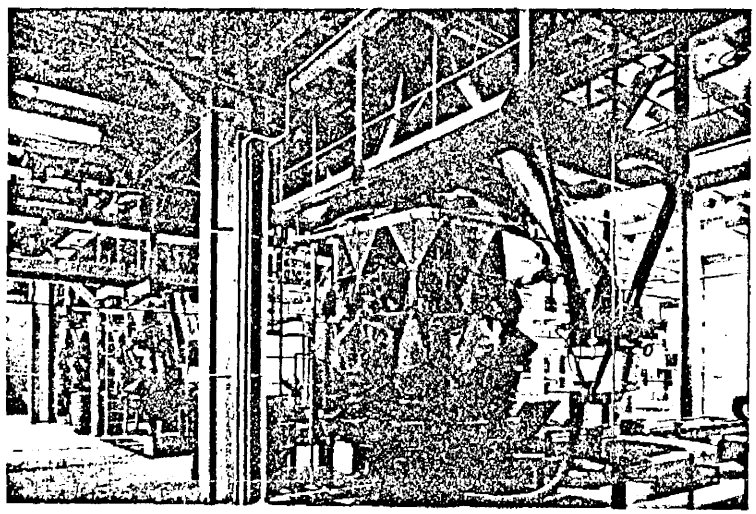
Ensemble de pesage - Ensachage Carroucels

Weighing - Carroucels sack filling sets

Wiege- und « Karussel » Absackanlage

Füllgut : Zelluloseazetatgranulat.
Leistungsfähigkeit : 250 Säcke/Std.
Wägegenauigkeit : ca.± 20 g.
Eine einzige mobile Einheit ermöglicht das Absacken von Zelluloseazetat, welches auf 6 Produktionssträngen mit einer Leistung zwischen 250 und 500 kg/Std. hergestellt wird.
Die Wagschale ordnet sich automatisch jeweils unter einem vollen Trichter an.
Diese Absackvorrichtung der Typenserie « D » ist eine Maschine für Bruttoverwiegung. Der Arbeitstakt beträgt 200 bis 250 Säcke/Std. je nach Füllgut.
Bei Anpassung des Beschickungssystems und des Sackfüllertyps kann diese Maschine auch für pulverförmige Füllgüter eingesetzt werden (Farbstoffe, chemische Stoffe, Milchpulver, usw.).



Pour sucre cristallisé, assurant des cadences instantanées de 60 t/h en sacs papier à valve de 50 kg.

For crystallized sugar, ensuring instantaneous rates of 60 t/hour in valve type paper bags of 50 kg.

Für Kristallzucker.
Garantiert Taktleistungen von 60 T/Std.
In Papierventilsäcken von 50 kg.

06-SIL-01
06-PACK-01

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

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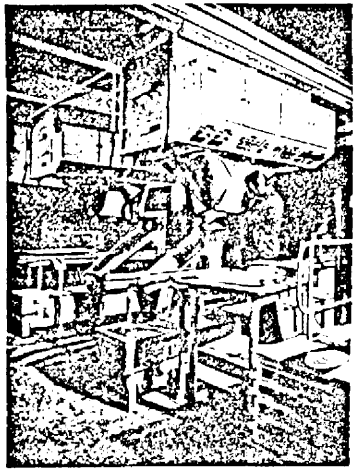
Groupe double Celmatic A 50

Celmatic A 50 double set

Doppeleinheit « Celmatic A 50 »



Produit : sucre cristallisé
Cadence : avec un seul homme : 800 sacs/h en 50 kg papier
Précision : sigma proche de 20 g

Dispositif de contrôle automatique.
Possibilité d'expédition vrac sur circuit annexe.

Ce type d'ensacheuse convient parfaitement pour tous les produits cristallisés ou granulés coulant bien (sucre, granulés plastique, grains, engrais granulés...).

En adaptant le système d'alimentation et le type d'empochoir, il est possible d'ensacher certains pulvérulents, tels que les poudres de lait, les produits chimiques, les farines...

Les Celmatic de la série A correspondent au haut de la gamme en cadence, en pesée nette.

Product : crystallized sugar
Rate : with only one operator : 800 paper bags/h of 50 kg
Accuracy : sigma close to 20 g.

Automatic control device.
Possibility of conveying in bulk onto auxiliary circuit.

This type of sack-filling is perfectly suitable for all the crystallized or granular product flowing smoothly (sugar, granules, plastics, granular fertilizer...).

When adapting the feeding system and the type of the sack-filling spout, it is possible to handle the sack-filling of certain pulverulents, such as milk powders, chemicals, flours...

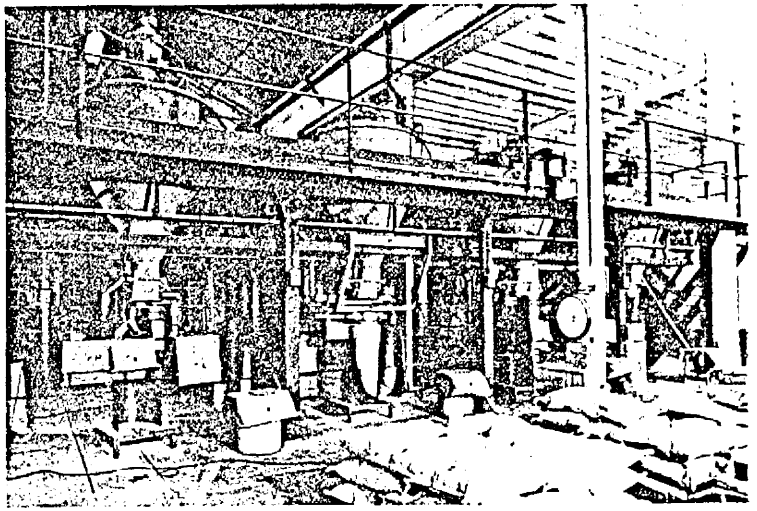
The Celmatic of series A corresponds as net weighing, to the top range rate.

Produkt : Kristallzucker.
Leistung : mit einem einzigen Arbeiter : 800 Säcke/Std. in 50 kg Papiersäcken.
Wägegenauigkeit : ca. ± 20 g.
Automatische Steuervorrichtung.
Schüttgutversandvorrichtung mit Zusatzeinrichtung.
Diese Absackmaschine eignet sich hervorragend für alle kristallisierten oder granulierten Produkte, die gut fliessen (Zucker, Plastikgranulate, körnige Stoffe, granulierte Düngemittel, usw.
Bei Anpassung des Beschickungssystems und des Sackfüllertyps ist es möglich, bestimmte pulverförmige Produkte, wie Milchpulver, chemische Stoffe, mehlartige Produkte, usw. abzusacken.
Die Celmatic-Maschinen der Typenreihe A liegen bei Nettoverwägungen leistungsmässig an der Spitze.

Groupe mobile Celmatic GD 50

Celmatic GD 50 mobile set

Bewegliche Einheit « Celmatic GD 50 »



Produit : granulé d'acétate de cellulose
Cadence : 250 sacs/h
Précision : sigma proche de 20 g

Un seul groupe mobile permet le conditionnement de l'acétate de cellulose produit sur six chaînes marchant entre 250 et 500 kg/h.

La bascule vient se positionner automatiquement sous une trémie pleine.

Cette ensacheuse de la série D est une machine en pesée brute, la cadence maximum est de 200 à 250 sacs/h suivant les produits.

En modifiant le système d'alimentation et le type d'empochoir, cette machine peut être utilisée sur produits en poudre (colorants, produits chimiques, poudres de lait...).

Product : cellulose acetate granule
Rate : 250 bags/h
Accuracy : sigma close to 20 g.

Only one mobile set allows the packaging of the cellulose acetate produced on six lines working between 250 and 500 kg/h.

The weighing machine comes automatically below a full hopper.

This sack-filling machine of D series is for gross weighing, the maximum rate is from 200 to 250 bags/h depending on the products.

When modifying the feeding system and the sac-filling spout type, this machine can be used on powder products (dyestuffs, chemicals, milk powders...).

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

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Ensemble de pesage - Enfûtage AS-20 G Duplex

Weighing - Drum filling set AS-20 G Duplex

Wiege- und Abfüllanlage AS - 20 G Duplex

Application
Large rates of flow when it refers to products flowing by gravity for filling drums, casks, board boxes, such as detergents and prills or granular chemicals.

Flow
1 200 weighings/hour, from 2 to 20 kg.

Anwendung :
Grosse Durchsätze bei Füllstoffen, die unter dem Einfluss der Schwerkraft fliessen, wie Reinigungsmittel und pelletierte oder leicht-gekörnte chemische Produkte, zum Abfüllen in grosse und kleine Fässer und Kartons.

Leistung :
1 200 Wägungen/Std. von 2 bis 20 kg.

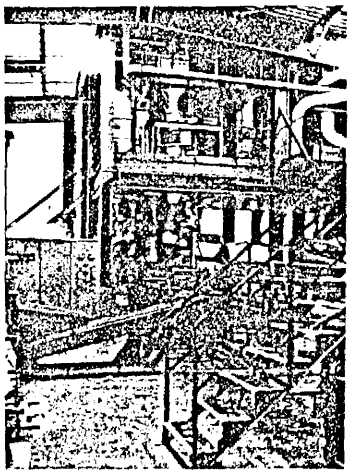
Utilisation
Grands débits sur produits s'écoulant de façon gravitaire pour remplissage de fûts, tonnelets, cartons, tels que détergents et produits chimiques prillés ou légèrement granuleux.

Débit
1 200 pesées/heure, d'une valeur de 2 à 20 kg.

Ensemble de pesage - Ensachage « Carroucel » + AS 50 G Duplex

Weighing-sack filling set « Carroucel » + AS 50 G Duplex

Wiege- und Absackanlage « Karussel » + AS 50 G Duplex



Application
High flow rates, in valve bags, on crystallized and granular products : sugar, granular fertilizer, polypropylene, polyethylene, polystyrene, etc...

Flow
Various versions ensuring rates from 800 to 1 400 bags/hour.

Verwendungszweck :
Hohe Durchsätze bei der Abfüllung in Ventilsäcke kristallisierter und gekörnter Füllgüter, wie Zucker, gekörnte Düngemittel, Polypropylen, Polyethylen, Polystyren, usw.

Leistung :
Verschiedene Versionen gewährleisten Absackleistungen von 800 bis 1 400 Säcken/Std.

Utilisation
Grands débits, en sacs à valves, sur produits cristallisés et granuleux : sucre, engrais granulés, polypropylène, polyéthylène, polystyrène, etc...

Débit
Différentes versions assurant des cadences de 800 à 1 400 sacs/heure.

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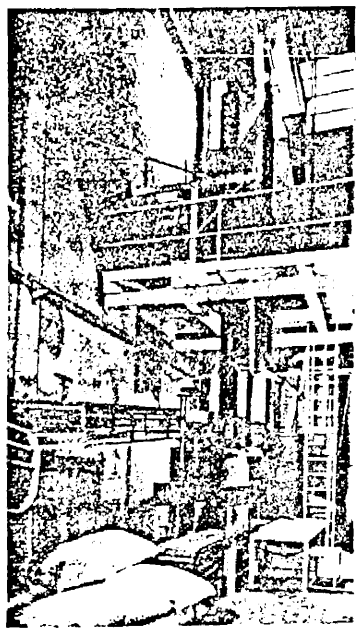
Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

1003384263

Système de pesage - Ensachage en sacs ouverts AS 50 W/TVC

System of weighing-sack filling in opened bags AS 50 W/TVC

Wiege- und Absackanlage AS 50 W/TVC für Säcke



Comprenant un dispositif de compactage par vis de compression.

Utilisation
Produits farineux nécessitant un compactage mécanique (farines de céréales diverses, farines de bois, issues de meunerie).

Débit
De 150 à 400 sacs/heure de 25 à 75 kg, suivant la nature des produits et la nature des sacs.

Including a compactor by compression screw.

Application
Flour like products requiring a mechanical compacting action (flours of various cereals, wood flours, flours coming from milling).

Flow
From 150 to 400 bags of 25 to 75 kg per hour, depending on the nature of products and bags.

mit Spindelpressenverdichtungs-vorrichtung.

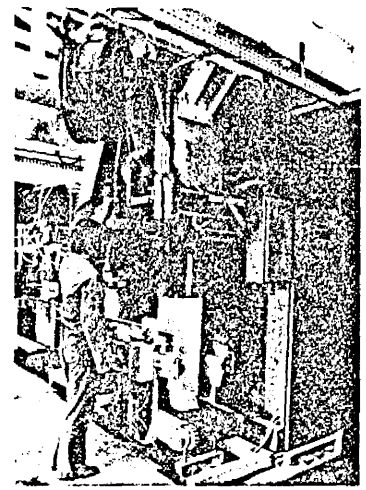
Verwendungszweck :
Mehlartige Produkte, die eine mechanische Verdichtung benötigen (verschiedene)Getreidemehle, Holzmehl und sonstige Mehle).

Leistung :
150 bis 400 Säcke/Std. von 25 kg bis 75 kg je nach Füllguteigenschaften und Art der Säcke.

Installation de pesage - Ensachage en sacs ouverts AC 50 W/DPF

Weighing-sack filling in opened bag plant AC 50 W DPF

Wiege- und Absackanlage AC 50 W/DPF für Säcke



Comprenant :
- un poste de pré-remplissage avec dispositif de désaération
- un appareil de pose automatique des sacs
- un poste de finition séparé assurant une précision de 20 g pour des pesées de 25 à 50 kg
- une unité de conformation et de fermeture des sacs par couture + bande rapportée + soudure de la sache interne.

Utilisation type
Poudre de lait, aliments pour veaux, produits chimiques micronisés.

Caractéristiques particulières
Fonctionnement « propre » hors poussières.

Débit
300 à 500 sacs/heure suivant valeurs des pesées et nature des produits.

Including :
- a pre-filling station with deaeration device
- an automatic bag placer
- a separate finish station ensuring an accuracy of 20 g for weighings from 25 to 50 kg
- a unit for forming and closing bags by seam + added tape + welding of the inner lining.

Type of application
Milk powder, food for calves, micronised chemicals.

Particular data
Dust free, « clean » operation.

Flow
300 to 500 bags/hour depending on weighings and nature of products.

Anlagenteile :
- eine Vorfülleinrichtung mit dazugehöriger Entlüftungsvorrichtung,
- eine automatische Sackanbringvorrichtung,
- eine getrennte Fertigverwiegungsstation, die für Wägungen von 25 bis 50 kg eine Genauigkeit von 20 g garantiert,
- eine Sackumfalt- und Schliessvorrichtung durch Vernähen plus Reiterband plus Verschweissen des Innenbeutels.

Verwendungszweck
Milchpulver, Kalbsfutter, feinstvermahlene chemische Produkte.

Besondere Eigenschaften
Saubere, staubfreie Betriebsweise.

Leistung
300 bis 500 Säcke/Std. je nach Wiegewerten und Eigenschaften des Füllgutes.

1003384263

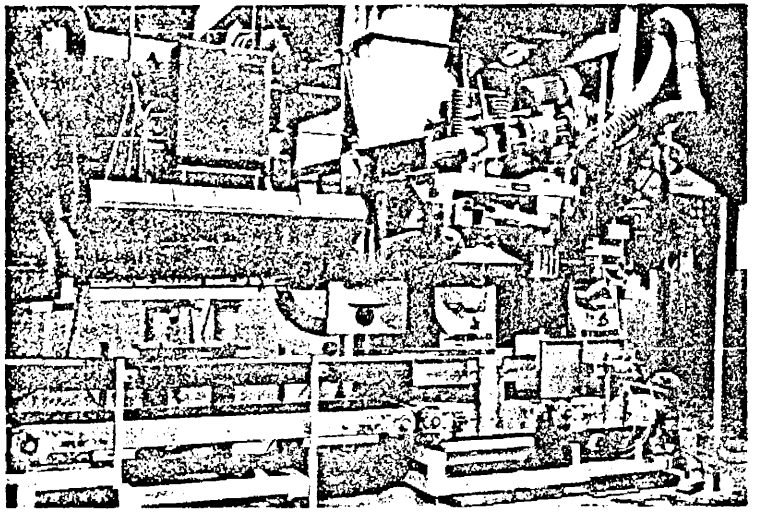
Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

1003384264

Ensemble de pesage - Ensachage WD - 50 DPF

Weighing - Sack filling set WD - 50 DPF

Wiege- und Absackanlage WD - 50 DPF



Comprenant :
- un poste de pré-remplissage avec dispositif de désaération
- un poste de finition séparé, assurant une précision de 20 g pour des pesées allant de 10 à 50 kg
- un poste de conformation des sacs assurant l'évacuation de l'air.

Débit
140 à 200 sacs/h suivant la valeur des pesées et suivant le produit.

Utilisation
Produits difficiles à désaérer, en sacs plastique ouverts, étanches et notamment les produits de granulométrie très fine : insecticides, pesticides, blancs minéraux de charge, lait en poudre, tous produits chimiques micronisés...

Caractéristiques particulières
Fonctionnement « propre », hors poussières pour produits toxiques, désagréables et même dangereux.

Including :
- a pre-filling station with deaeration device
- a separate finish station, ensuring an accuracy of 20 g for weighings from 10 to 50 kg
- a bag forming station ensuring air escape.

Flow
140 to 200 bags/h depending on weighings and product.

Application
Products difficult to de-aerate, in opened plastic bags, sealed and particularly for very fine products : insecticides, pesticides, mineral fillers, milk powder, any micronised chemicals...

Particular characteristics
« Clean » working, dust free for toxic, unpleasant and even dangerous products.

Anlagenteile
- eine Vorfülleinrichtung mit dazugehöriger Entlüftungsvorrichtung,
- eine getrennte Fertigverwiegungs-station die bei Wägungen von 10 bis 50 kg eine Genauigkeit von 20 g garantiert,
- eine Sackumfaltvorrichtung mit entsprechender Luftabsaugung.

Leistung
140 vis 200 Säcke/Std. je nach Wiegewerten und Eigenschaften des Füllgutes.

Verwendungszweck
Abfüllung schwerentlüftbarer Produkte in offene, dichte Plastiksäcke, besonders feinkörnige Füll-güter wie Insektizide, Pestizide, mineralische Ballaststoffe, Milchpulver, sowie alle feinst-vermahlenen chemischen Produkte.

Besondere Eigenschaften
Saubere, staubfreie Betriebsweise für toxische, übelriechende und auch gefährliche Füllgüter.

1003384264

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

1003384265

Installation d'enfûtage PFX

PFX drum · Filling plant

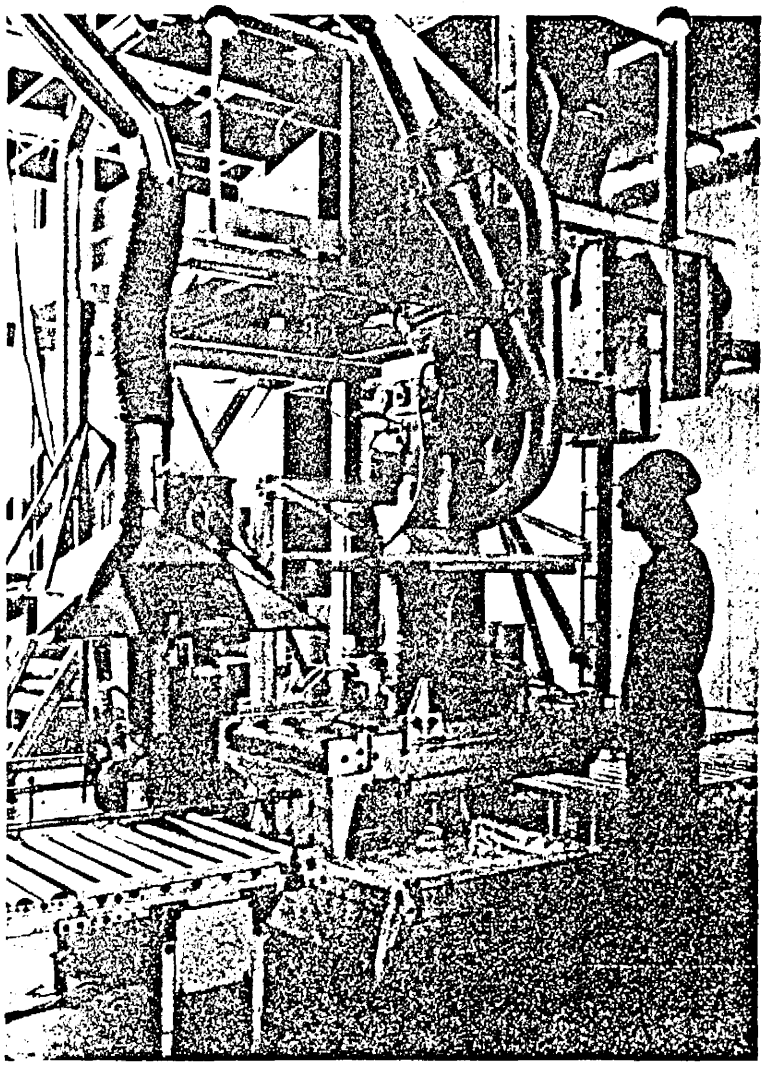
Abfüllanlage « PFX »

Utilisation
Produits exigeant des précautions particulières,à cause de leur toxicité,des dangers de pollution qu'ils présentent et d'un écoulement particulièrement difficile.
Principe
Pesée brute (directement dans le contenant) sans réserve de produit mais avec dispositions assurant la régularité d'écoulement nécessaire à une précision satisfaisante.
Caractéristiques particulières
Très large gamme de pesées (chaine de mesure 2000 points); fonctionnement hors poussieres, grâce à un dispositif élaboré d'aspiration.
Débit
Ce modèle d'unité concerne des débits peu importants de l'ordre de 80/120 emballages/h et est généralement surabondant. Ce type d'installation hors standard la plupart du temps,peut être adapté à toutes les exigences particulières que l'on peut rencontrer,en particulier,dans les divers aspects de la chimie fine et de la pharmacie:
- installations stériles en chambres closes,
- installations avec circuit produit lavable,
- installations entièrement lavables, intra et extra circuits,
- installations non contaminantes et non contaminables.

Utilization
Products requiring particular care because of their toxicity, pollution dangers they represent and particularly difficult flowing.
Principle
Gross weighing (directly in the vessel) without product reservation but with measures ensuring the flowing regularity necessary to a satisfactory accuracy.
Particular characteristics
Very large range of weighings (measuring chain 2 000 points) ; Dust free operation thanks to a sophisticated suction device.

Flow
This unit refers to flows of small importance ranging from 80 to 120 packings/hour.
This type of plant, out standard most of the time, can be adapted to all particular requirements that one may encounter, specially, in the various aspects of fine chemical and pharmacy :
- sterile plants in closed rooms,
- plants with cleanable circuit,
- inner and outer circuit, fully cleanable plants,
- non-contaminating and non contaminable plants.

Verwendungszweck
Füllgüter, die auf Grund deren Giftigkeit, Verschmutzungs-gefahr und des schwierigen Fliessverhaltens besondere Schutzmassnahmen erfordern.
Arbeitsprinzip
Bruttowägung (direkt in den Behälter) ohne Produktereserve, jedoch mit Vorrichtungen, die ein gleichmässiges Fliessen, welches für die gewünschte Genauigkeit erforderlich ist, gewährleisten.
Besondere Eigenschaften
Breiter Wägebereich (2 000 Skalenteile). Staubfreier Betrieb dank einer gutfunktionierenden Absaugvorrichtung.
Leistung
Dieses Modell ist für geringe Leistungen in der Grössen-ordnung von 80 bis 120 Abfüllvorgänge pro Stunde vorgesehen und ist im allgemeinen reichlich bemessen. Dieser Anlagentyp kann auf Grund seiner in den meisten Fällen nicht serienmässigen Herstellung den gegebenen Betriebserfordernissen angepasst werden, vor allem für die verschiedenen Anwendungsfälle in der Feinchemie und der Pharmazeutik : · keimfreie Anlagen in geschlossenen Räumen · aussen und innen vollkommen waschbare Anlagen · nicht kontaminierende und nicht kontaminierbare Anlagen.



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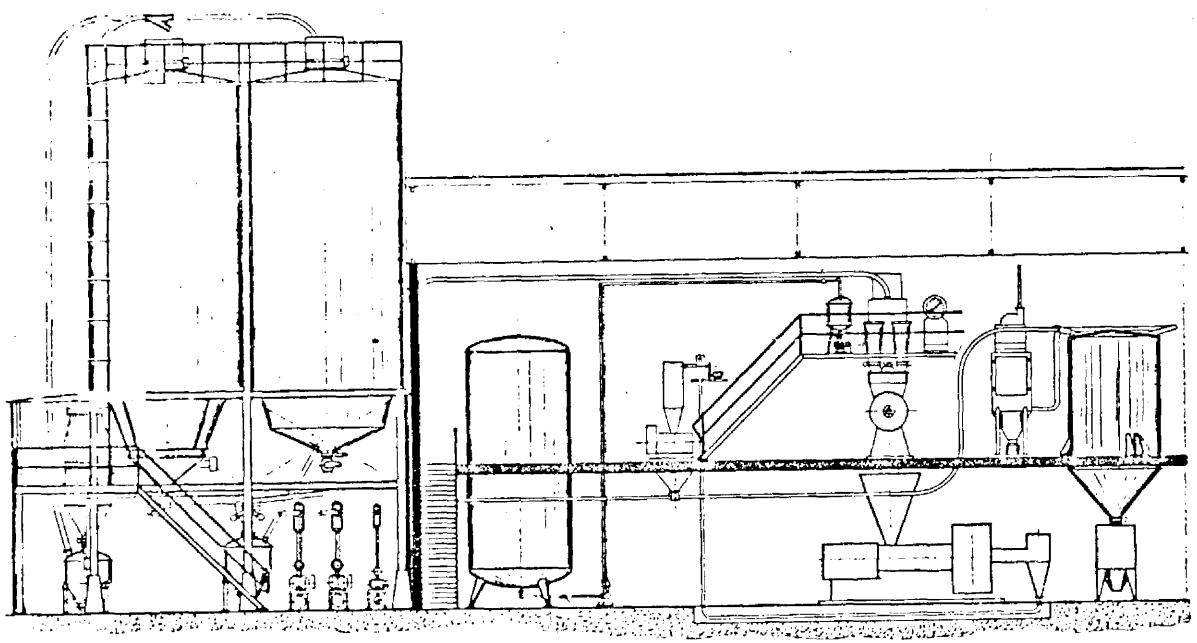

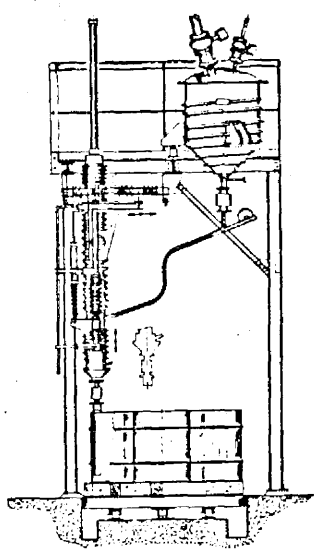

POSTE DE MISE EN FUTS
de produits chimiques

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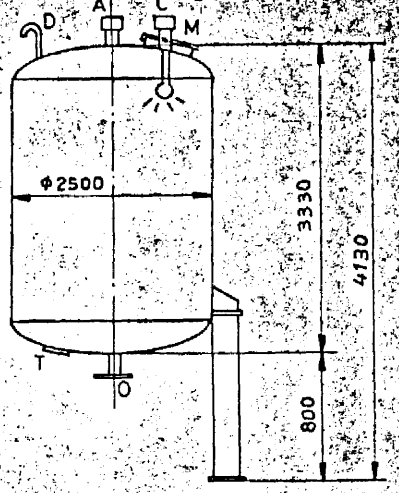

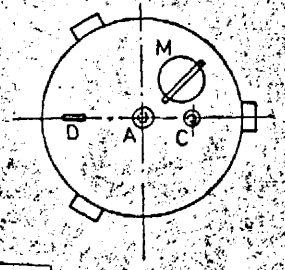

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TECHNICAL DATA

06-T-01
06-T-02
06-T-03

ITEM NO. 3 pcs

CONSTRUCTION NO.	
TOTAL VOLUME	15 m³
OPERATING VOLUME	--
HEATING JACKET	--
MEDIUM	Ninomat 18 DS
OPERATING PRESSURE	
VESSEL	Drucklos
HEATING JACKET	
TEST PRESSURE	
VESSEL	
HEATING JACKET	
MATERIAL	
VESSEL	AISI 304
HEATING JACKET	--
FLOWSHEET	9x/9513203

SURFACE TREATMENT	
INTERNAL	cleaned
EXTERNAL	cleaned
INSULATION	
MATERIAL	
MIN. TEMPERATURE	°C
MAX. TEMPERATURE	°C
OPERATING TEMPERATURE	
VESSEL	80°C °C
HEATING JACKET	°C
OPERATING WEIGHT	appr. 16'750 Kg
VESSEL WEIGHT, EMPTY	appr. 1'750 Kg

ITEM:	SPECIFICATION	N° PIECES	SIZE	REMARKS
A	PRODUCT INLET	1	NW 32	
B	AIR INLET	--	--	
C	CLEANING NOZZLE	1	NW 25	
D	AIR OUTLET	1	NW 25	
E	SIGHT GLASS WITH LAMP	--	--	
F	OVERFLOW	--	--	
G	SIGHT GLASS	--	--	
H	HW INLET	--	--	
I	HW OUTLET	--	--	
K	INOCULATION - TRANSFER	--	--	
L	STAND GLASS	--	--	
M	MANHOLE	1	NW 500	
N	MANHOLE	--	--	
O	BOTTOM - OUTLET	1	NW 32	
P	PI - MANOMETER	--	--	
Q	SAMPLE VALVE	--	--	
R	CHEMICALS	--	--	
S	STIRRER FLANGE	--	--	
T	LEVEL TRANSMITTER	1	NW 100	
U	TI - THERMOMETER	--	--	
V	TEMP. TRANSMITTER	--	--	
W	pH TRANSMITTER	--	--	
X	AP - PROBE	-	--	
Y	AP - INLET	--	--	
Z	CIRCULATION	--	--	

PHILIP MORRIS
WA 18 041

A | D
B | E
C | F

Puffertank 15 m³

GROUP NO. 06

SCALE NTS

DRWD BY KN 11.7.80
CHECKED BY WP 11.7.80
PROJ ENG
PROC ENG

PEC Process Engineering Company
CH 8708 Männedorf Switzerland

3 | 9513283

Source: https://www.industrydocuments.ucsf.edu/docs/rhyj0000

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07

1003384268

1003384268

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Chemical storage	GROUP NO. 07	OFFER NO.	WA: 19'041
PHILIP MORRIS		ORDER NO.	PAGE: 1

ITEM	PIECE	SPECIFICATION	kW	MAT.	SIZE / CAP.	REMARKS
T-01	1	H_3PO_4 Storage Tank		4435	95 m^3	
T-02	1	" " "		4435	95 m^3	
T-03	1	KOH Preparation Tank		4435	10 m^3	
T-04	1	Antifoam Storage Tank		4301	6,6 m^3	
P-05	1	Centrifugal Pump		4435	10m^3/h,15mWs	
P-06	1	Centrifugal Pump		4435	10m^3/h,15mWs	
P-07	1	Centrifugal Pump		4435	5m^3/h,15mWs	
	1	Screw Conveyour			L= 7m 0,5m^3/h	for KOH
	1	Floor Balance				Special lining for KOH

p.e.c.	DATE: 11.7.80	CHECKED BY: W. Frei	NO. 4-951 3222/ 3225

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

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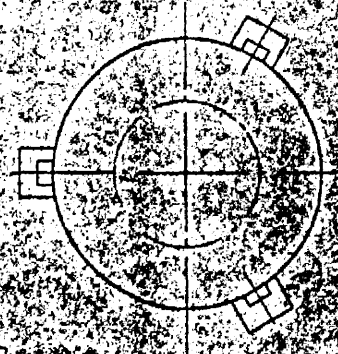

TECHNICAL DATA

CONSTRUCTION NO.	ITEM NO. T-C-01-02
TOTAL VOLUME	95 m³
OPERATING VOLUME	~ 93 m³
HEATING JACKET	—
MEDIUM	H_3PO_4
OPERATING PRESSURE	
VESSEL	—
HEATING JACKET	—
TEST PRESSURE	
VESSEL	—
HEATING JACKET	—
MATERIAL	
VESSEL	4435
HEATING JACKET	—
FLOWSHEET	3-951 3222

SURFACE TREATMENT	
INTERNAL	glasslined + pickled
EXTERNAL	
INSULATION	
MATERIAL	—
MIN. TEMPERATURE	— °C
MAX. TEMPERATURE	— °C
OPERATING TEMPERATURE	
VESSEL	new 20 °C
HEATING JACKET	— °C
OPERATING WEIGHT	— kg
VESSEL WEIGHT, EMPTY	— kg

ITEM	SPECIFICATION	Nº PIECES	SIZE	REMARKS
A	PRODUCT INLET	1		
B	AIR INLET	1	UHB 14/10	
C	CLEANING NOZZLE	—		
D	AIR OUTLET	—		
E	SIGHT GLASS WITH LAMP	—		
F	OVERFLOW	—		
G	SIGHT GLASS	—		
H	HW INLET	—		
I	HW OUTLET	—		
K	INOCULATION - TRANSFER	—		
L	STAND GLASS	1	25 M	
M	MANHOLE	1	500	BREWERY - TYPE
N	MANHOLE	—	150	
O	BOTTOM - OUTLET	1	NW 50	flange
P	PI - MANOMETER	—	R 1/2	
Q	SAMPLE VALVE	—	R 3/4	
R	CHEMICALS	—	UHB 14/10	
S	STIRRER FLANGE	—		
T	LEVEL TRANSMITTER	1	100	
U	TI - THERMOMETER	—	R 1/2	
V	TEMP. TRANSMITTER	—	1 1/4 NPSM	
W	PH TRANSMITTER	—	SPECIAL	DRWG NO. ORIGINAL
X	AF - PROBE	—	M 26 x 1	
Y	AF - INLET	—	UHB 14/10	
Z	CIRCULATION	—		

	WA		A	D	
			B	E	
			C	F	

H_3PO_4 Storage Tank	GROUP NO.	SCALE 1/1	DRWD BY	5.6.80	kasper
			CHECKED BY		
			PROJ. ENG.		
			PROC. ENG.		
Sulzer Escher Wyss Engineering Company CH 8706 Meilenbach Switzerland		3	951 3223		

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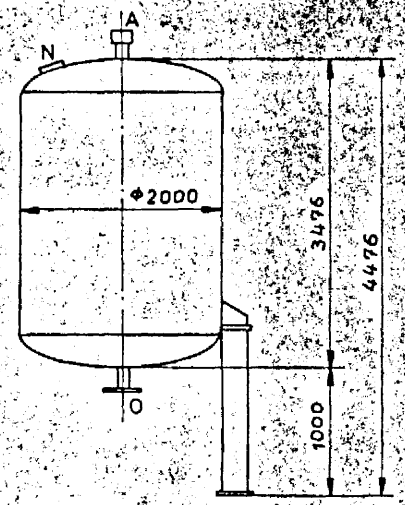

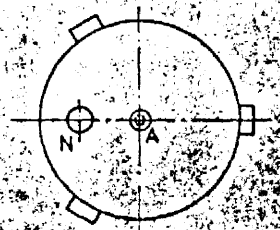

TECHNICAL DATA

CONSTRUCTION NO.	1	ITEM NO. 1 pcs.	07-1-01
TOTAL VOLUME	10 m³		
OPERATING VOLUME	--	SURFACE TREATMENT	
HEATING JACKET	--	INTERNAL	cleaned
MEDIUM	KOH 30%	EXTERNAL	cleaned
OPERATING PRESSURE		INSULATION	
VESSEL	pressureless	MATERIAL	--
HEATING JACKET	--	MIN. TEMPERATURE	-- °C
TEST PRESSURE		MAX. TEMPERATURE	-- °C
VESSEL	pressureless	OPERATING TEMPERATURE	
HEATING JACKET	--	VESSEL	-- °C
MATERIAL		HEATING JACKET	-- °C
VESSEL	carbon steel		
HEATING JACKET	--		
FLOWSHEET	4x/9513230	OPERATING WEIGHT	app. 11'350 kg
		VESSEL WEIGHT, EMPTY	app. 1'350 kg

ITEM	SPECIFICATION	Nº PIECES	SIZE	REMARKS
A	PRODUCT INLET	1	NW 32	
B	AIR INLET/OUTLET	1	NW 25	
C	CLEANING NOZZLE	--	--	
D	AIR OUTLET	--	--	
E	SIGHT GLASS WITH LAMP	--	--	
F	OVERFLOW	--	--	
G	SIGHT GLASS	--	--	
H	HW INLET	--	--	
I	HW OUTLET	--	--	
K	INOCULATION - TRANSFER	--	--	
L	STAND GLASS	--	--	
M	MANHOLE	--	--	
N	HANDHOLE	1	NW 200	
O	BOTTOM - OUTLET	1	NW 25	
P	PI - MANOMETER	--	--	
Q	SAMPLE VALVE	--	--	
R	CHEMICALS	--	--	
S	STIRRER FLANGE	--	--	
T	LEVEL TRANSMITTER	--	--	
U	TI - THERMOMETER	--	--	
V	TEMP. TRANSMITTER	--	--	
W	pH TRANSMITTER	--	--	
X	AF - PROBE	--	--	
Y	AF - INLET	--	--	
Z	CIRCULATION	--	--	

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PHILIP MORRIS
WA 18 041

A | D
B | E
C | F

KOH 30% Tank, 10 m³

GROUP NO. 03

SCALE 1/TS

DRWD BY	KN	11.7.80
CHECKED BY	WF	11.7.80
PROJ ENG		
PROC ENG		

PEC Process Engineering Company
CH 8708 Männedorf / Switzerland

3

9513275

Source: https://www.industrydocuments.ucsf.edu/docs/mhyl0000

1003384272

Antifoam Storage Tank

3320
2520
800
2000
L
D
A
B
M

ITEM	SPECIFICATION	PIECES	SIZE	REMARKS
A	PRODUCT INLET	1	1" NW 100	
B	AIR INLET			
C	CLEANING NOZZLE			
D	AIR OUTLET			
E	SIGHT GLASS WITH LAMP			
F	OVERFLOW			
G	SIGHT GLASS			
H	HW INLET			
J	HW OUTLET			
K	INOCULATION TRANSFER			
L	STAND: GLASS			
M	MANHOLE			
N	HANDHOLE			
O	BOTTOM OUTLET			
P	PI - MANOMETER			
Q	SAMPLE VALVE			
R	CHEMICALS			
S	STIRRER PLANE			
T	LEVEL TRANSMITTER			
U	TEMPERATURE			
V	TEMP. TRANSMITTER			
W	PH TRANSMITTER			
X	AF PROBE			
Y	AF - INLET			
Z	CIRCULATION			

TECHNICAL DATA

CONTENT FUNCTION	
CAPACITY VOLUME	
OPERATING VOLUME	
HEATING JACKET	
MEDIUM	
OPERATING PRESSURE	
SURFACE PROTECTION	
INTERNAL	Polished
EXTERNAL	Painted
INSULATION	
MATERIAL	
HEATING JACKET	
MIN. TEMPERATURE	
MAX. TEMPERATURE	
OPERATING PRESSURE	
VESSEL	2 bar
HEATING JACKET	
OPERATING TEMPERATURE	
VESSEL	130°C
HEATING JACKET	
TOLERANCE	±3%
VESSEL	430 l
HEATING JACKET	
POWDER	3-5 gr/cm³
OPERATING WEIGHT	
VESSEL WEIGHT EMPTY	

A		D	
B		E	
C		F	

GROUP NO.	SCALE	1:10
	DRWG BY	GE MO Jaeger
	CHECKED BY	
	PROJ. Engr.	
	MFG. Engr.	

3.957225

PROPRIETARY INFORMATION
CONTROLLED DOCUMENT

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08

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( ) IN THE VIDEO CABINET _____

( ) ON THE OVERSIZE SHELF _____

( ) IN THE MICROFORMS CABINET _____

( ) AT THE WAREHOUSE _____

( ) IN THE TRANSLATION/TRANSCRIPTION FILES

_____

(X) OTHER _____

OVERSIZE DOCUMENT IN COLLECTION

1003384275

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3.8 CIP CLEANING SYSTEM FLOWSHEET 951 3230

This system is automatically controlled from the panel and works as per flowsheet 951 3230. The cleaning can be performed seperate for each vessel. There is also a possibility to clean more vessels at the same time. The cleaning is performed as per customers requirements. The following description for washing is a proposal due to our experience.

Washing-program, applicable for tanks

1. step 5 minutes prewashing with cold water
2. step 5 minutes washing with hot water
3. step 5 minutes spaying with KOH
4. step 5 minutes rinsing with hot water
5. step 5 minutes rinsing with cold water

Consumption for each step: 7,5 m^3 1'981 GAL

Washing program, applicable for fermenters

The fermenters contain 3 upper cleaning balls and 3 lower cleaning balls.
For the 3 lower cleaning balls the above mentioned five steps apply. For the 3 upper cleaning balls the wash programm is different. Therefore it is advisible that the fermenters are cleaned seperately.

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Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

Program for the 3 upper cleaning balls

1. step 5 minutes prewashing cold water	cons.	7,5 m^3
2. step 5 minutes washing hot water	cons.	7,5 m^3
3. step 5 minutes spraying KOH	cons.	45 m^3
4. step 5 minutes rinsing hot water	cons.	7,5 m^3
5. step 5 minutes rinsing cold water	cons.	7,5 m^3

Note:

For the 30 minutes KOH spraying the EFFIGAS® turbine will be taken in operation.

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1003384277

Source: https://www.industrydocuments.ucsf.edu/docs/hbyl0000

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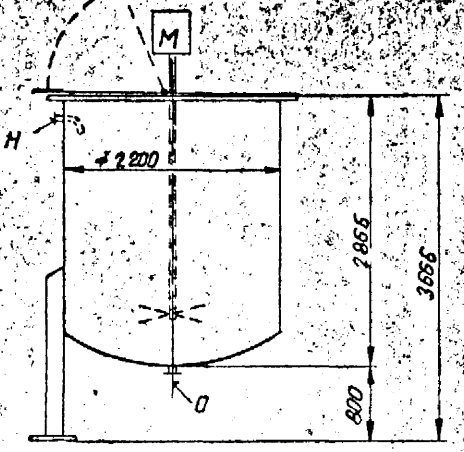

Stirrer : 450 U/min
El. Motor : 2,2 kW

TECHNICAL DATA

CONSTRUCTION NO.		ITEM NO.	97-T-03
TOTAL VOLUME	10 m³		
OPERATING VOLUME	9 m³	SURFACE TREATMENT	
HEATING JACKET	—	INTERNAL	pickled
MEDIUM	30 % KOH	EXTERNAL	pickled
OPERATING PRESSURE		INSULATION	
VESSEL	—	MATERIAL	—
HEATING JACKET	—	MIN. TEMPERATURE	— °C
TEST PRESSURE		MAX. TEMPERATURE	— °C
VESSEL	—		
HEATING JACKET	—	OPERATING TEMPERATURE	
MATERIAL		VESSEL	— °C
VESSEL	4435	HEATING JACKET	— °C
HEATING JACKET	1		
FLOWSHEET	3-951.3222	OPERATING WEIGHT	
		VESSEL WEIGHT EMPTY	

ITEM	SPECIFICATION	Nº PIECES	SIZE	REMARKS
A	PRODUCT INLET	—		
B	AIR INLET	—		
C	CLEANING NOZZLE	—		
D	AIR OUTLET	—		
E	SIGHT GLASS WITH LAMP	—		
F	OVERFLOW	—		
G	SIGHT GLASS	—		
H	W INLET	1	1"	
I	HW OUTLET	—		
K	INOCULATION-TRANSFER	—		
L	STAND GLASS	—	25 M	
M	MANHOLE	—	500	BREWERY-TYPE
N	HANDHOLE	—	150	
O	BOTTOM-OUTLET	1	NW 32	DIN 11851
P	PI-MANOMETER	—	R 1/2"	
Q	SAMPLE VALVE	—	R 3/4"	
R	CHEMICALS	—	UHB 16/10	
S	STIRRER FLANGE	—		
T	LEVEL TRANSMITTER	—	100	
U	TI-THERMOMETER	—	R 1/2"	
V	TEMP TRANSMITTER	—	1 1/4 NPSM	
W	pH TRANSMITTER	—	SPECIAL	ORWO NO. 076635 INGOLD
X	AF-PROBE	—	M 26x1	
Y	AF-INLET	—	UHB 14/10	
Z	CIRCULATION	—		

WA

A		D	
B		E	
C		F	

KOH Preparation Tank

GROUP NO	SCALE	DRWD BY	6.6.80	Kasper
		CHECKED BY		
		PROJ ENG		
		PROC ENG		

PEC Process Engineering Company
CH-8708 Männedorf Switzerland

3 | 9513224

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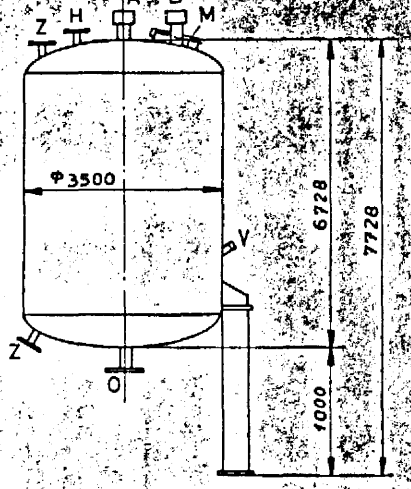

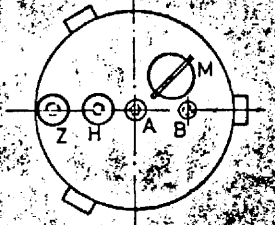

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TECHNICAL DATA

CONSTRUCTION NO.	
TOTAL VOLUME	60 l
OPERATING VOLUME	
HEATING JACKET	
MEDIUM	H₂O + KOH 3%
OPERATING PRESSURE	
VESSEL	pressureless
HEATING JACKET	
TEST PRESSURE	
VESSEL	pressureless
HEATING JACKET	
MATERIAL	
VESSEL	AISI 316 L
HEATING JACKET	
FLOWSHEET	4x/9513730

ITEM NO. 1 pcs. 07-5-02

SURFACE TREATMENT	
INTERNAL	cleaned
EXTERNAL	cleaned
INSULATION	
MATERIAL	
MIN. TEMPERATURE	
MAX. TEMPERATURE	
OPERATING TEMPERATURE	70
VESSEL	
HEATING JACKET	
OPERATING WEIGHT	app. 65'000 kg
VESSEL WEIGHT, EMPTY	app. 5'000 kg

ITEM:	SPECIFICATION	Nº PIECES	SIZE	REMARKS
A	PRODUCT INLET	1	NW 150	
B	AIR INLET	1	NW 50	
C	CLEANING NOZZLE	--	--	
D	AIR OUTLET	--	--	
E	SIGHT GLASS WITH LAMP	--	--	
F	OVERFLOW	--	--	
G	SIGHT GLASS	--	--	
H	HW INLET	1	NW 40	
I	HW OUTLET	--	--	
K	INOCULATION - TRANSFER	--	--	
L	STAND GLASS	--	--	
M	MANHOLE	1	NW 500	
N	HANDHOLE	--	--	
O	BOTTOM - OUTLET	1	NW 125	
P	PI - MANOMETER	--	--	
Q	SAMPLE VALVE	--	--	
R	CHEMICALS	--	--	
S	STIRRER FLANGE	--	--	
T	LEVEL TRANSMITTER	--	--	
U	TI - THERMOMETER	--	--	
V	TEMP. TRANSMITTER	1	spec. nozzle	
W	pH TRANSMITTER	--	--	
X	AF - PROBE	--	--	
Y	AF - INLET	--	--	
Z	CIRCULATION	2	NW 80	

PHILIP MORRIS WA 18 041

A	D
B	E
C	F

GROUP NO.	707	SCALE	DRWD BY	XN	11.7.80
		NTS	CHECKED BY	WF	11.7.80
			PROJ ENG		
			PROC ENG		

PEC Process Engineering Company

3 | 9513276

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4. UTILITIES AND ENERGY REQUIRMENTS

Total consumptions of the plant

	Peak	Average
Steam	2200 kg/h	1550 kg/h
Cooling water	960 m^3/h	880 m^3/h
Hot water	23 m^3	8 m^3
Air	220 Nm^3/h	220 Nm^3/h
Process water	18 m^3/h	3 m^3/h
Electrical energy installed	1375 kW	1165 kW

Remarks:

Peak values are to be unterstood with three main fermenters in operation and one fermenter in the sterilisation process.

Average values apply for the continuous operation of the plant.

There will be additional consumptions and electric energy. For the optional evaporation for the extract from 9% TS to 48% TS,
see the following requirements:

Steam Consumption	approx. 2200 kg/h
Cooling Water Consumption	approx. 80 m^3/h
Electrical energy	approx. 28 kW

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ARCHIVE LOCATION VARIANCE SHEET

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( ) IN THE TRANSLATION/TRANSCRIPTION FILES

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OVERSIZE DOCUMENT IN COLLECTION

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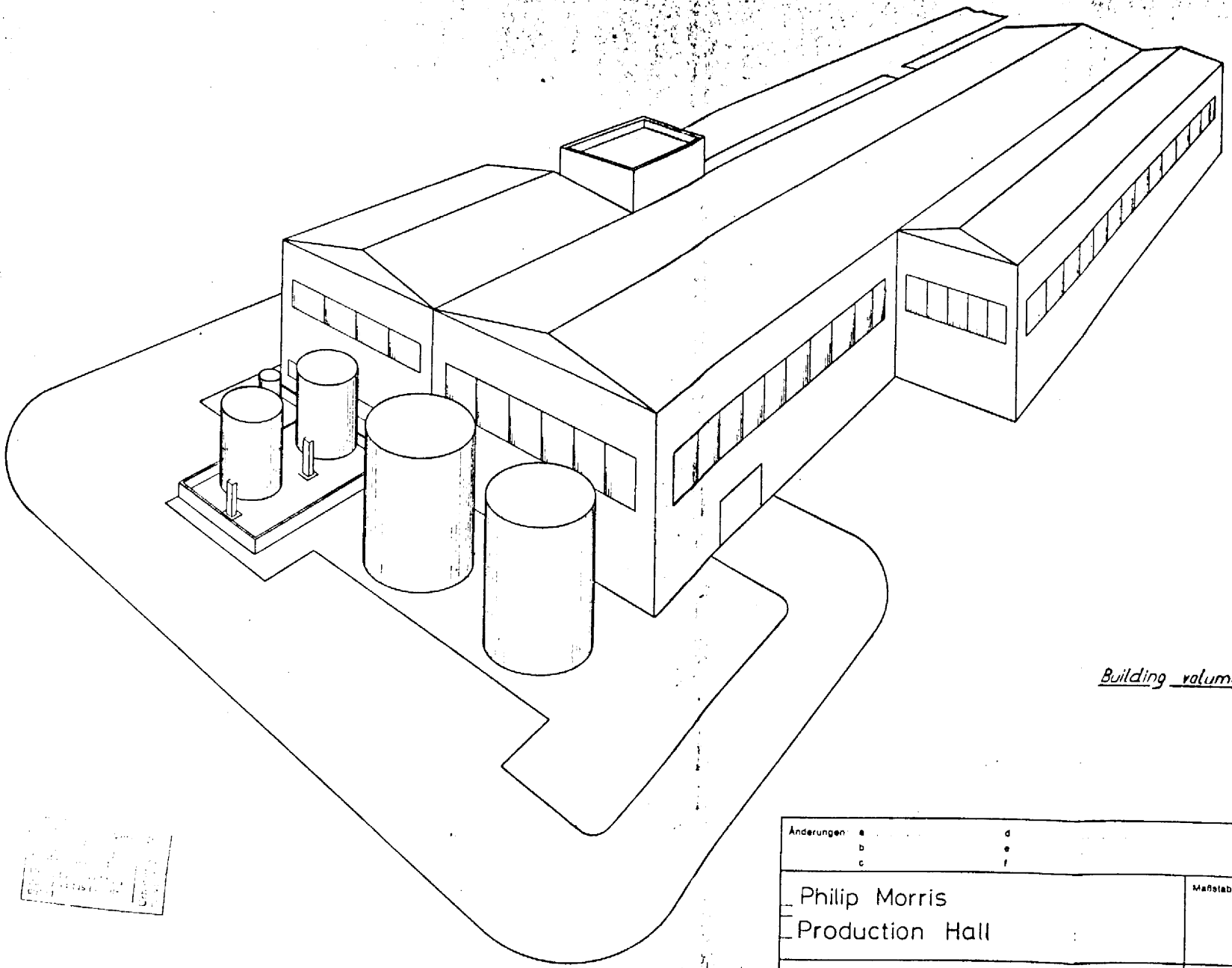

Building volume : 19 800 m³

Änderungen a d b e c f			Ersetzt durch Ersatz für		
Philip Morris Production Hall	Maßstab	Gezeichnet	14.7.80	kasper	
		Geprüft			
		Normgeprüft			
		Gesehen			
PEC Process Engineering Company, CH-8708 Männedorf, Switzerland	3	951 3284			

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6. INSTALLATION AND START-UP

6.1 Supervision of installation

For the supervision of installation, PEC supplies the following personnel for a period of 6 months:

1 installation engineer	120 working days
1 electrical supervisor	120 working days
1 mechanical supervisor	120 working days
3 persons from PEC	360 working days total

Based on the attached wage rates, the costs will be as follows:

		Sfr.
1 installation engineer	120 days at 579.- =	69'480.-
1 electrical supervisor	120 days at 375.- =	45'000.-
1 mechanical supervisor	120 days at 375.- =	45'000.-
	TOTAL	159'480.-

6.2 Living-away allowance

For engineers and supervisors Sfr. 130.- per day

TOTAL 540 days at 130.- = Sfr. 70'200.-

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6.3 Start-up supervision

For the start-up, PEC supplies the following personnel for a period of approx. 2 months:

1 fermentation specialist	40 working days
1 mechanical/electrical specialist	40 working days
2 persons from PEC	80 working days total

Based on the attached wage rates, the start-up supervision costs will be as follows:

		Sfr.
1 fermentor specialist	40 days at 579.- =	23'160.-
1 mech./elect. chief specialist	40 days at 497.- =	19'880.-
	TOTAL	43'040.-

6.4 Living-away allowance

For engineers and supervisors Sfr. 130.- per day

TOTAL 120 days at 130.- = Sfr. 15'600.-

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6.5 Customer supply of installation labour

During the installation period the customer has to supply the following labour at his expense:

1 engineer	120 working days
1 mechanical foreman	120 working days
1 electrical foreman	120 working days
4 mechanical specialists	480 working days
2 electrical specialists	240 working days
8 pipe fitters	960 working days
8 unskilled workers	960 working days
	3'000 working days total

6.6 Installation material

The installation material such as:

- cranes
- frame-work
- welding machines
- all kinds of tools
- auxiliary material

is not included, and has to be provided by the customer.

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6.7 Wage rates

The rates for wages, as listed below, are to be understood per working day and refer to a normal weekly working period of 44 hours.

Possible insurance premiums (luggage, accident, travel-risk are included in these rates. Fees originating from financial transactions as well as taxes and other charges are to be billed separately.

Wage rate for engineer (installation engineer and fermentation specialist)	Sfr. 579.-/working day Sfr. 80.80/hour overtime
Wage rate for chief supervisor (electrical-mechanical specialist)	Sfr. 375.-/working day Sfr. 50.90/hour overtime
Wage rate for chief supervisor	Sfr. 497.-/working day Sfr. 69.40/hour overtime

Living-away allowance

For engineers and supervisors	Sfr. 130.-/day

Working hours during public holidays

Hours worked during Swiss public holidays (January 1st and 2nd, Good Friday, Easter Monday, Ascension Day, Whit Monday, December 25th and 26th) will be invoiced by an additional charge of 100% on normal daily wage.

The daily wage is based on 8.8 hours per day; additional time worked will be charged at the normal overtime rates.

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Additional travelling hours and partially worked days

When daily rates are applied, additional travelling hours and partially worked days have to be calculated according to the following formula:

$$\frac{\text{Daily rate (working day)}}{8.8} \times \text{number of hours}$$

Sickness and accident

In the event of sickness or accident, the company has to pay for the wages and cover costs of sick-nursing. 50% of the valid daily wage has to be charged to the customer for overseas installation.

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7. BATTERY LIMITS

7.1 Included in our offer are:

- all equipment according to the separate item lists under division 3
- the engineering (according to specification division 8)
- the automation and instrumentation of the equipment delivered by PEC (Chemap)
- the installation and start-up supervision (according to division 6)

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7.2 EXCLUSIONS FROM OUR OFFER

For the time being and prior to detailed discussions we decided not to include the following plant elements.

We are of course prepared to submit in the course of the final layout any assistance which may be necessary to complete these periphery off-site elements and plant sections.

Therefore, any obligations other than those of PEC-delivered equipment are excluded from the scope of our quotation, such as:

7.2.1 Off-site plant units

- the effluent water treatment, including drainage piping and channelling inside and outside the plant system
- water supply system, water make-up system
- recooling towers, if necessary, in the event of cooling water limitation

7.2.2 For civil parts

- all detail engineering works pertaining to foundation, building construction. finishing, building protection (e.g. floor tiling etc.), sanitary installations, ponds and basins, plumbing, sewage, drainage etc.
- all execution works pertaining to the scope of performances as per above.

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7.2.3 For the mechanical part

- all mobile transport equipment such as trucks, fork lifts, mobile cranes for installation etc.
- all outdoor piping to and from battery limits, i.e. 1 m outside the plant's system periphery
- air-conditioning and ventilation system
- fire-fighting equipment
- all execution works on protection lining and painting
- staff facilities etc.
- equipment and facilities for unloading chemicals and utilities, transported by "Others" to the plant site and to be stored in tanks etc.
- all laboratory equipment (are considered as existing)
- lubrification oils and greases

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7.2.4 For the electrical part

- high voltage distribution system, including the main switch gear and the transformer station, HV cables to the plant site
- air ventilation equipment for the trafo-room
- lighting system (included for alcohol plant only)
- communication system
- clock and warning system
- emergency power system
- provisional power supply during installation
- underground cable protection piping

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8. ENGINEERING

Documentation/PEC engineering

8.1 Basic and execution engineering for :

- complete specification relating to the extent of the delivery
- equipment floor plan (lay out)
- piping diagrams for the single pieces of equipment as well as the connection to the service points
- plans of the electrical installations and interconnections between the pieces of equipment
- layout plans of the workrooms
- installation and drainage plans for the following services in the plant :
  - steam distribution and condensate returns, from and to the connection points
  - process water distribution
  - compressed air
  - warm water distribution
  - cooling and chilled water distribution and return from and to the connection points
- technical documentation of the entire plant
- specification for the design of plans for the construction of steel structure for platforms, stages, railings.

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8.2 Basic engineering

- preliminary general layout of the plant area
- preliminary layout of the necessary working area
- preliminary flowsheets, list of parts and specifications of equipment, delivered by the Seller
- preliminary delivery schedule, based on installation and area preparation, to be agreed to by Buyer.

8.3 Detailed engineering

- dimension drawings for foundation of machinery equipment, including floor load, drain channels etc., as basis for drawings of the civil engineering of Buyer as well as for use
- dimension drawings of all vessels and other equipment
- final layout of the plants
- final flowsheet and list of parts
- final list of deliveries
- final delivery schedule
- piping drawings, showing all important process lines as well as all pipes larger than 80 mm in diameter; smaller pipes will be indicated during installation on site

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- calculation and diagram showing consumption of all services (with peak)

- detailed list of qualifications and hours of installation personnel

- electric diagram and layout of electric installations as well as detailed lists of parts

- process control layout and description

- list of spare parts

- technical documentation for:

  a) installation and maintenance of special equipment
  b) operation manuals.

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9. LABOUR REQUIREMENT

The following list of personel to operate the dentrification plant with Biomass treatment was completed unter the following considerations:

a) a relatively high control and instrumentation as per our proposal

b) Existing Management and administration facilities

c) Existing facility for repairs and maintenance of the the plant.

Labour

9.1	Supervision	per shift	Total
	supervisior	1	3
9.2	Skilled labour		
	laboratory		(2)
	pilot- and seed-fermenter-line	1	3
	Nutrient chemicals and preparation		1
	medium sterilisation and fermentation	1	3
	buffering and separation	1	3
	evaporation and drying	1	3
		5	18

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9.3	Unskilled labour	per shift	Total
	Uebertrag	5	18
	chemicals and Nutrient preparation	-	1
	medium sterilisation	1	3
	bagging and storage		~~2~~ 1
	Total during operation	24	17 + (lab 1)
	plus 1 spare shift	6	6
	TOTAL	30	23

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( ) IN THE TRANSLATION/TRANSCRIPTION FILES

_____

(X) OTHER _____

OVERSIZE DOCUMENT IN COLLECTION

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11. PRICE LIST

Group 01 Medium preparation	Sfr.	3'952'900.-
Group 02 Seed Line	"	542'000.-
Group 03 Chemicals	"	146'200.-
Group 04 Fermentation	"	4'323'500.-
Group 05 Separation on Evaporation of tabaco extract	"	3'375'900.-
Group 06 Evaporation, drying and packing of Ninomass	"	2'286'000.-
Group 07 Chemical storage	"	350'900.-
Group 08 CIP-System	"	232'600.-
Group 09 Services (El. power panel)	"	43'700.-
TOTAL GROUP 01 - 09	Sfr.	15'244'700.-
Pipes and Fittings 10% of the total Group 01 - 09	Sfr.	1'524'000.-
Electrical Installation 6% of the Group 01 - 09	Sfr.	914'000.-
TOTAL HARDWARE	Sfr.	17'682'700.-
Engineering 15% of total Hardware	Sfr.	2'650'000.-
Erection supervision acc Group 6 approx.	Sfr.	230'000.-
Start up supervision acc Group 6 approx.	Sfr.	58'640.-

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20,122,000 = 20 % 12.5 %

Source: https://www.industrydocuments.ucsf.edu/docs/hhyl0000

12. CONDITIONS

12.1 Prices

- all prices to be understood ex works Switzerland without transportation, packing and insurance.
- the prices for erection supervision and start up supervision, and the buyers supply of erection labour, are based on a plant to be built in Switzerland.

Above mentioned prices to be adapted if plant site will be in an other European country.

12.2 Validity

Valitity of the quotation 31st December 1980.

12.3 Delivery time see group 10

12.4 Payment condition

to be discussed

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12.5 Mechanical Guarantees

Under the terms of the guarantee covering our products, any defects that are shown to be due to faulty materials, construction or manufacture and are discovered within 12 months during an 8 hr fermentation run (fermenter operating during the day only) or 6 months during a 24 hr fermentation run (fermenter operating day and night). This mechanical warranty expires 12 months after date of delivery. Transportation costs for parts will be charged to the customer's account.

12.6 Remarks

Due to the stainless steel price fluctuation on the international market, we reserve the right to adapt the prices accordingly.

PEC
Process Engineering Company

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The Chemap Group
Chemap AG, CH-8708 Männedorf, Switzerland
P.E.C. Process Engineering Company, Switzerland
Chemap GmbH, D-403 Ratingen, FR Germany

Chemapec Inc., Hoboken, N.J. 07030 USA
Chemapec S.A.R.L., F-69500 Bron, France
P.E.C. A-2380 Perchtoldsdorf/Vienna, Austria
Chemapec (PTY) Ltd., Johannesburg, S.Africa

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